

The Uses of Water in Modern Medicine,
VOLUME II.

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THE USES OF WATER

IN MODERN MEDICINE.

BY

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VOL II.—CHAPTER I.

TECHNIQUE OF HYDROTHERAPY—PROCEDURES HAVING FOR THEIR OBJECT GENERAL EFFECTS.

In describing these procedures, only those will be referred to whose action has been found of value in the author's personal experience or observation. Many subdivisions—as head-baths, wrist-baths, arm-baths, etc.—which are found in the books of the hydropaths and in some regular treatises, will, therefore, be omitted. It is the aim of this work to simplify hydrotherapy and render it accessible as far as possible to the general practitioner. It must be reiterated here, however, that *minute attention to details* is the first essential for the successful application of all hydriatic procedures.

ABLUTIONS.

The simplest hydriatic procedure is the local or general ablution. It serves as an introduction to more active measures. It consists in the application of water by the hand, either naked or covered by a bath glove or holding a linen wash-cloth. The sponge is to be avoided because it does not produce sufficient friction and discourages reaction. The method and the temperature of the water vary with the object in view. Several vessels filled with water

of proper temperatures must be within reach. In acute febrile affections, with temperature above 101° F., an oil-cloth or rubber sheet is laid upon one side of the bed, covered by a blanket, and upon this a linen sheet or tablecloth is spread, one half reaching to and over the edge of the bed, the other half rolled up on the other side of the bed. The patient is now placed upon the sheet, and his face is bathed with water at from 65° to 50° F., beginning with the higher temperature and on each application reducing it two or more degrees. The chest and arms, the back, abdomen, and lower extremities are successively bathed by freely applying the water. This is far superior to sponging, which chills by evaporation, while the gentle shock of the impact of the water applied in this method, accompanied and followed by gentle friction, arouses the peripheral nerves, and thus refreshes the entire system by its reflex agency. The difference of refreshing effect is made evident by comparing, in the ordinary morning toilet, the simple moistening of the face with a cold, wet sponge to the usual method of dashing handfuls of cold water against the face, with friction. The refreshing and antifebrile effect may be enhanced in vigorous individuals with high temperatures by not drying the body until the ablution is complete. Judgment, however, must be exercised to avoid chilling and to bear in mind that reaction is aimed at.

Another method for enhancing the antifebrile

effect is the placing of wet linen towels (always without fringes, to prevent drizzling) successively over the chest, abdomen, back, and upper parts of extremities, and throwing water upon them by the hand or from a sponge, followed by friction and patting over the wet towel. This procedure approximates a bath, and often accomplishes quite as good results for reduction of temperature and refreshing effect as the full or half bath. By modifying the temperature of the water and length of time, the antifebrile effect may be modified. After the ablution, which may be repeated once or twice, the patient is dried. It is repeated when the temperature rise again demands it. In the early stages of all febrile affections, except pulmonary and bronchial, this method will be found of value.

In chronic affections, too, the ablution is a useful preliminary to the more active hydriatic procedures. It has long been my custom, learned in treating the desperately depreciated cases presenting themselves at the Montesiore Home—many of whose patients have been utter strangers to cold water in health even—to pursue the following course: The patient receives a thorough warm, cleansing bath with soap and flesh-brush. On the following day he is wrapped, nude, in two long-haired, woolen blankets. One blanket is spread on the bed, the patient laid upon it with arms outstretched, and the blanket is snugly wrapped around his body and between his legs. The arms are now placed alongside the body; and the

second blanket is tucked around him, so that the upper corners are firmly fastened under his neck and the lower edge folded under his feet. He now lies like a mummy in the warm room, more covers being laid upon him. A glass or two of ice-water will promote the action of the skin. Having lain from half an hour to an hour, and thus accumulated heat upon the surface, his face is bathed in water from 50° to 80° F., always beginning with the latter; the blankets are successively opened over his chest, abdomen, back, lower extremities, and arms, and these are successively bathed with the hand, and each part immediately dried and replaced under cover. A general dry rubbing with a woolen cloth or the hand follows, and he then is made to take some exercise if he is able to do so—otherwise he remains in bed and receives a cup of warm liquid food. This application is best made in the early morning hours, but may be made at any time, and repeated, as the reactive power demands, for several days.

The next step in the hydriatic education of the patient is a *general ablution*. The patient stands in twelve inches of water at 95° to 100° F., and is rapidly washed down with the hands, having water at 50° to 80° F. poured upon him with the hand or from a vessel, followed by gentle friction. Lower the temperature each day, according to the development of the patient's reactive condition. This simplification of the methods adopted by special hydrotherapists, like

Fleury, Winternitz, and Duval, has served me so well that I must insist on its value. I might give numerous observations on the subject—cases in which all the most valued medicinal and hygienic measures have failed, until this simple auxiliary was added and changed the entire aspect of the case. Even in poor servant girls, in whom anæmia and chlorosis are so common, who are sometimes brought to me by their sympathetic mistresses, with ashen faces, cardiac bruits, glassy eyes, etc., an astonishing change has been wrought by simply adding cold ablutions to the iron or other medication. It will not suffice, however, to tell an anæmic girl, "You must bathe in cold water every day." The importance of the shock from the brief impact of cold water must be impressed upon them, and the physician should prescribe the temperature of the water and the method of using it, as he would medicine. In the early summer months, when the water is 70° to 75° F. and the air not much warmer, the shock will be slight. Ice must be added to a basinful of water, or several basinfuls should be precipitated over the shoulders and body from a height, in order to compensate by the mechanical effect for the absence of temperature difference. But, aside from their therapeutic effect, ablutions are most valuable as introductory to other hydriatic procedures in acute as well as in chronic disease, inasmuch as they furnish a clue to the reactive power of the patient. If, for instance, the skin remains cool and

pale or becomes cyanotic after ablution and friction, we are warned to proceed cautiously to more intense procedures. The reactive condition of the patient is thus disclosed in chronic disease, and, in addition to this, the extent of heat retention in acute disease is distinctly indicated.

The rationale of the action of ablutions may be sought in the peripheral shock and subsequent stimulus, which is refreshing, and in the dilatation of the superficial vessels by the friction, which, according to Weyrich, increases the evaporation from the skin 50 per cent., which must be of great value in fever, because, according to Leyden and others, retention of water is one of its chief elements.

Added to this effect, we have the dilatation of the superficial capillaries, as evidenced by the rosy hue of the skin following ablution with friction. We also have the deepening of the inspiration produced by the impingement of cold water upon successive parts, which improves the circulation. If the heart's action is feeble, by the improvement of tone in the peripheral circulation its work is facilitated by removing the impediment existing in the correspondingly feeble cutaneous vessels. This *vis à fronte*, due to the enhanced contractility of the vessels, diminishes the need of a strong *vis à tergo* upon the part of the heart. This explains the reason why ablutions are a most valuable initiatory procedure which the feeblest subjects may bear with impunity.

THE HALF-BATH.

This procedure is much used for reduction of temperature and refreshing the system in acute febrile affections, and for its tonic, improving, reflex effect following relaxing procedures, to be referred to later, in chronic diseases. A large tub is filled with water to the depth of about twelve inches. The temperature of the water is adapted to each case, from 50° to 80° F. After having a wet towel wrapped around his head, the patient, if he is not too weak, seats himself in the tub, which contains water at 85° F. The attendant bathes his face, and begins at once to rub his back with the left hand, while with the right he dashes water from a small pail (like a milking-pail) with a long handle, over the shoulders of the patient. The latter at the same time rubs the front of his body with both hands. Colder water is added from vessels prepared for the purpose, until the patient's teeth chatter. The continuously renewed application of the water, and the successive shocks upon the body by the moving columns of water, accompanied by friction, stimulate the peripheral nerves, dilate the superficial vessels, and thus refresh the entire organism, the effect being more intense than that described under "Ablutions." Especially important is the absence of pressure from the water, which characterizes the full bath, and which would not encourage the dilatation of the surface vessels so much as is done by

the ever-recurring changes of temperature produced by the temporary and repeated impact. Friction, too, is more readily applied when the body is not submerged. If the patient is too weak, he may lie in the bath and refrain from washing himself, or he may change from the recumbent to the sitting posture, being subjected to general frictions in the former and to drenchings with the pail in the latter.

THERAPEUTIC APPLICATION OF THE HALF-BATH.

If the technique of the half-bath is thoroughly mastered, it may be utilized as the most universal hydriatic procedure we have. In cases of acute fever without organic lesion, it may follow or take the place of the ablutions above described. The small body of water does not inspire the patient with apprehension; the gradual and even rapid lowering of the temperature of the water is scarcely perceived, because the agitation counteracts the sudden cooling, and friction promotes immediate reaction. As in most fevers, especially those of infectious origin, the rise of temperature is connected with and partly due to a spasmodic contraction of the superficial vessels, which intercepts heat-diffusion from the skin, we accomplish one of the chief indications for temperature-reduction and nerve-stimulation by the dilatation of the vessels which surely follows friction after the forcible application of cold water. The more slowly heat is abstracted, the more enduring will be the lowering of

the bodily temperature. In this half-bath we may graduate the rapidity of heat-abstraction by the proper gauging of the temperature of the water and of the frictions. But the half-bath is not so applicable for these purposes as are others to be presently mentioned. It is more as an introduction to other and more effective baths that the bath here described is useful as an antifebrile measure.

In chronic diseases in which the wet pack or other procedure, to be referred to below, has produced a dilatation and relaxation of the superficial cutaneous vessels, the half-bath is a necessary adjunct for the purpose of restoring the tone of those vessels. In these cases the tub should be filled to one-fourth its depth, say ten inches, with water from 50° to 70° F., which should be actively set in motion by the hands of the patient and attendant, as directed in the opening lines describing this procedure; the duration should be from ten to twenty minutes. When the patient arises from the bath, a coarse linen sheet, previously kept in readiness, should be thrown around him, and with this he should be rapidly dried. In acute fevers the drying should be done in bed, a blanket and sheet having been previously prepared, as directed above in the case of general ablutions.

CONDITIONS DEMANDING THE HALF-BATH.

There are certain conditions occurring in acute disease in which the half-bath is a most important

adjunct. When the patient is unconscious or delirious, muttering or otherwise; when he presents evidences of depreciated nerve force; when the superficial vessels react feebly, as manifested by more or less cyanosis, and the heart is laboring to compensate for the loss of elasticity in the capillaries (an element which greatly aids the propulsion of the blood in normal conditions); when the bronchi are loaded with mucus, and the air-vesicles clogged by hypostatic congestion, no remedy will arouse the failing powers like a half-bath, properly administered. The patient may be placed or held in a semi-recumbent position in water at a temperature of 95° F., while the upper part of his body is bathed and dried, with friction, with water at 45° to 60° F. The refreshing effect of such a bath, judiciously given, will never be forgotten by anyone who has once witnessed it. The patients who entered this bath with muttering delirium are aroused to consciousness, the eye brightening and the countenance losing its apathetic appearance. Others, whose respirations were shallow before the bath, breathe deeply, cough and expectorate freely, and return to bed with lungs freed from threatening hypostasis. In others, again, whose cyanotic or marbled skin indicated heart failure, the surface becomes ruddier, a more active cutaneous circulation ensues, and the pulse gains in force and diminishes in frequency. The reflex effect upon the vagus deepens the inspiration, a fresh supply of oxygen is carried to the feebly expanding

lung, the heart is aroused, and hypostatic embarrassment is overcome. The whole aspect of the case is changed by the brief application of cold to the surface, followed by rapid drying. Now stimulants act more efficiently, their effect being more enduring. The testimony of that experienced clinician, Winter-nitz, which has been confirmed repeatedly, should be borne in mind, when the terrible collapse menaces life. "Collapse," says he, "is almost universally regarded as a counter-indication to every application of cold. I would again express the opinion that I know no more powerful or effective agent for combating threatening or existing collapse than the intense and intelligently applied excitation by cold. How often have I seen, in advanced fever processes, in degenerated typhoids, a rapidly favorable change wrought in the corpse-like coldness of the extremities, in the most serious manifestations of nerve adynamia, in the hypostatic congestion of lungs, by one dipping into a very cold bath, or one cold application. I am firmly convinced that very often these manifestations are not due to heart feebleness, but to a collapse of the vessels, and here an evanescent but energetic excitation by cold is the only reliable remedy, as I have repeatedly proved." Henoch (D. Med. Ztg., Sept. 1, 1890) speaks highly of cold as a stimulant in collapse of children's maladies. He advises a warm half-bath (91° F.), with cold affusion over the neck and chest.

AFFUSION.

Affusion is the procedure by which the patient, sitting or standing in an empty tub, or lying upon a rubber cot, receives a stream of water issuing from a bucket or pitcher, preferably the former because the stream may be broader. According to the height from which the water is poured, and the low temperature (45° to 60° F.), will be the stimulating effect. In feeble patients it is well to begin with higher temperatures and short distances. The action of these brief impingements of water (the head being usually omitted and wrapped in a wet towel) is the same as explained above. It is more energetic, however, because of more brief duration. *Therapeutic indications* are offered by conditions of coma, stuporous delirium indicating adynamia and nerve prostration. It is this method by which Currie made his remarkable cures in typhus fever, using chiefly sea-water on board the ship. In *scarlatina*, when the system is overwhelmed by the poison, the circulation embarrassed, the skin pale or marbled or cyanotic, the respiration shallow, temperature high, pulse rapid and feeble, truly marvelous results may be obtained by the judicious brief use of affusions. Reaction occurs rapidly, and with it come an improved peripheral and general circulation, deepened inspiration, bright countenance, and roseate skin. Let not the fear of cold deter anyone from resorting to cold affusions, 70° to 60° F., in these desperate cases.

IN PULMONARY AFFECTIONS.

Professor Hoffmann, of Leipsic (Allgem. Therapie), says: "The greatest benefit has been obtained from the use of cold rubbings and douches in diseases of the lungs. No injurious results have ensued from their intelligent application. It is well known how cold affusions over the chest and neck produce quite peculiar energetic inspiratory movements. Hence they have long been used to deepen the breathing in somnolent patients. Fever patients, who respire superficially and thus favor the production of hypostasis, may be thus protected against a dangerous complication. An effect upon the deep respiration is here evidenced, which furthers the circulation from the right to the left heart, and which results in a dilatation of the cutaneous vessels and in a proportional anaemia of the inner organs."

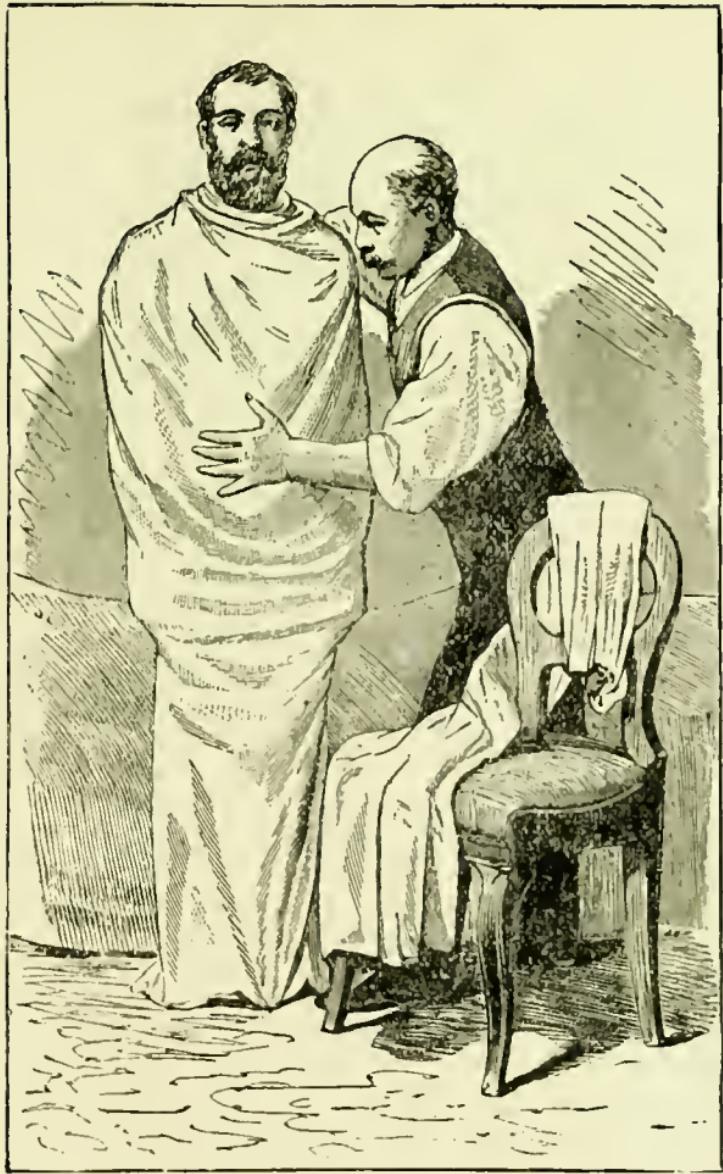
THE SHEET BATH.

To Priessnitz we are indebted for this practical and ingenious method of applying water in acute disease, where the patients by reason of feebleness are unable to accept more heroic methods, or in chronic disease as a means of refreshing the nervous system, which serves the purpose almost as well as the more frequently used douches of the French school.

The sheet bath is applied as follows: A rubber-sheet is laid upon the bed, and several linen sheets,



Application of the Sheet Bath (dripping sheet), standing—
First stage. (Preller.)



Application of the Sheet Bath (dripping sheet), standing—
Second stage.

coarse or fine according to the effect required, are placed in readiness. One of the sheets is now dipped into water at from 50° to 80° F., according to effect desired, and more or less wrung out—never so completely as for the wet pack, however, which will be described later. The sheet is laid upon the rubber cloth. The head and face of the patient having been bathed with ice-water, and a wet cloth placed upon his head, he is now laid upon the wet sheet, and is wrapped with it as follows: While he holds both arms up, the right one-third of the sheet is wrapped snugly, but not tightly, around the body, bringing the upper edge over close under the left axilla and the lower along the left thigh. The left arm is now brought down, and that portion of the sheet beneath the latter brought over the body in front, carried over the right shoulder, and the upper edge tucked in around the neck, the entire left edge being snugly tucked in beneath the right side of the body. Care should be taken that a fold be placed between the extremities, or that no parts of the body lie in apposition. The arms may in feeble patients be left out altogether, and simply bathed during the process. The first impression will be a shock to the peripheral nerves. This is readily overcome by the patient's own temperature, and its removal is aided by the manipulations of the bath nurse, who, with outstretched hands gently and gradually sweeping over the wet sheet, passes over the entire body successively. So soon as any part of the body becomes thoroughly

warmed again, water from 50° to 60° F., according to condition of patient, is poured from a cup or squeezed from a sponge over the part. These gentle passes or frictions are alternated with the pouring on of small quantities of cold water, until the body feels cooled or the patient shivers a good deal. Rigor must always be avoided, because it is an evidence of contraction of the vessels and of a too decided temperature difference between the central and peripheral portions of the body. As the friction prevents this objectionable feature of all cold baths, and enables us by the renewed application of cold water upon the warm parts of the sheet to maintain the cooling effect, we have in the sheet bath an admirable antipyretic, whose effect may be greatly enhanced by allowing the patient to remain in it—withdrawing the rubber sheet and wrapping him in a blanket—for half an hour. Its mildness as compared with the full cold bath renders it more acceptable to the patient and his friends, and it may thus be utilized as a valuable initiatory antipyretic measure, intermediate between the ablution and the half-bath, which have been discussed. It is applicable in all acute diseases in which an elevated temperature is a leading manifestation, and it may form a substitute for the full bath in some of them where the necessary apparatus for the latter cannot be procured. For instance, in the country, where bath-tubs are not obtainable, linen sheets, or at least linen table-cloths (or even old and well-worn cotton

sheets), with a piece of oil-cloth, a blanket, or bagging to protect the bed, a bucket of water, and sponge, are all that are needed. By using a sofa or lounge for administering the sheet bath, or placing patient on the floor, it may be given with an abundance of water from the sponge or a pitcher, the superfluous heated water being kept from overflowing by a careful absorption with the sponge. It should always be remembered that there is no danger of the patient, with a temperature of 103° and over, taking cold. This bugbear often prejudices the physician, as well as the patient, against all hydriatic measures.

To enhance the antipyretic and soothing effect, the patient may be covered up in the wet sheet for half an hour. The *antipyretic action of the sheet bath* may be explained as follows: The immediate effect upon the peripheral vessels is to contract them, and drive the blood from the cutaneous surface toward the interior. For this reason a wet bandage and occasional affusion upon the head are necessary to prevent retrostasis with determination of blood to the head. Since, however, the shock to the sensory nerves is brief, and no sooner is conveyed to the nerve centres than it is reflected by the motor tracts, the local action is really evanescent. The sheet rapidly warms up if the patient's temperature is above 102° . The addition of cold water upon the warmest parts of the sheet abstracts heat from the vessels which have been dilated by the frictions referred to.

In this manner there is a gradual cooling off and re-heating of the sheet, which is conveyed from and to the parts beneath it. Each time the cold water impinges upon the sheet, a deepened inspiration ensues, which furnishes more oxygen. The dilatation of the peripheral vessels removes the previously existing abnormal resistance to the blood pressure, and thus gives the heart freer action, reducing the pulse rate, and, if the patient be allowed to rest in the wet sheet, a calm sleep ensues. A rational antipyretic effect is thus inaugurated, which does not fatigue the patient so much as the full bath.

THE SHEET BATH IN CHRONIC DISEASE.

But not only in acute disease is this method applicable. In all chronic affections accompanied by some elevation of temperature, it is a useful adjunct, and in many cases an important element in the treatment. In the first and second stages of phthisis, for instance, Von Ziemssen has said of it (*Etiology and Therapeusis of Tuberculosis* [Geo. S. Davis] p. 88): "I cannot conclude the chapter without referring to hydrotherapy, which occupies a very important position, both for the prevention and for the cure of tuberculosis." He then describes a modification of the sheet bath for hardening the body: "The sheet should be wrung out of lukewarm water first, and later colder water may be used. The practice drives the vaso-motor nerves of the peripheral arteries to

prompt reaction. It acts centripetally as a thermo-irritant to the nervous system, stimulating and refreshing it, and indirectly on the innervation and functions of the respiratory, circulatory, and digestive systems. At first, water at about 86° F. is to be used, and the cloth should be well wrung out. On each succeeding morning the temperature of the water may be reduced $1\frac{1}{8}$ ° F. It is important that the cloth should be well wrung out, the aim being to produce a thermic and mechanical irritation of the superficial vessels and nerves, not to deprive the body of any considerable heat. The latter effect would be produced if the cloths were saturated with cold water. To attain the desired end, very low temperatures are not needed, and it is seldom necessary to go below 66° F. Such friction baths can be used in private practice everywhere and among the poorest people. Unless the patient is very weak, I do not permit him to return to bed after rubbing. It would be much better if he would at once take some outdoor exercise, if the weather permit, and return after an hour to his breakfast." Local frictions with cognac are not approved of by Von Ziemssen. He says correctly: "They miss the essential thing—that is, the sort of shock which is produced by wrapping the body in a wet cloth or sheet, and which injures the surface to the sudden cold or dampness, and produces prompt action of the superficial vessels and hardens the sensitive nerves. Should a more thorough treatment be

desirable, the patient should be sent to a water-cure establishment." In the Montefiore Home, where, as has been mentioned, the most depreciated cases of phthisis are received in all stages, the treatment is begun, as above stated, by ablutions; and these are followed by the daily sheet bath, as follows (the large increase of patients has led me to adopt the rain bath recently): The temperature of the room is not below 68° F.; the patient stands in a foot-tub containing twelve inches of water at 100° F.; a sheet dipped into water at 70°—daily or less frequently reduced until it reaches 60°—is thrown dripping over his head and back. While he rubs himself vigorously in front, the attendant makes rapid passes over the sheet up and down the back, sides, and lower extremities with the outstretched hand, occasionally pouring a basin of water, 10° to 15° below that of the sheet water, over the head and shoulders. This is alternated with frictions from five to ten minutes. The sheet is now rapidly withdrawn. In most cases, especially after the treatment has been pursued for some time, the skin becomes decidedly hyperæmic. Friction with a dry sheet or towel increases the cutaneous suffusion, and the patient emerges from this bath greatly refreshed, and goes out to walk in good weather. The saturation of the sheet is governed by the presence of elevated temperatures.

There are many chronic ailments to which the wet sheet is applicable, especially as a substitute for the douche.

The flexibility and simplicity of the method commend it especially. It is probably the most flexible hydriatic measure known. By wringing the sheet well out, or by using a coarser sheet, or a lower temperature for a shorter time, or by slapping with, instead of simply pressing, the hand over the wet sheet, the local excitation of the cutaneous nerves and vessels will be enhanced. By saturating it with more water, the antipyretic effect is increased, which may be still more intensified by more prolonged application and frequent addition of colder water, or by a finer texture of the sheet. The duration of the sheet bath is a matter for the most careful discrimination. *Two to five minutes* suffice in most cases for the tonic effect, while for the antipyretic effect fifteen to twenty minutes may be necessary. It is, of course, understood that the excessive sensitiveness of the skin in the presence of cutaneous diseases or inflamed surface precludes the use of the sheet bath entirely. In the care necessary in adapting the sheet bath and other hydriatic procedures to various conditions must be sought the reason why the best informed medical men in France and Germany send their chronic cases, which have resisted simple measures, to colleagues who have made a special study of hydrotherapy, and consign them to their treatment entirely. A large experience enables these gentlemen to adapt, by infinite variations, seemingly slight to the uninitiated, certain modifications which promote recovery after

less intelligently applied hydriatic measures have sometimes failed. I do not desire to be understood, however, that the general practitioner is not perfectly competent to treat such cases hydriatically. On the contrary, it is the aim of this work to lend him such assistance as may enable him to treat his patients at home, and to discover the limitations of home treatment, for many cases are needlessly sent away from home to a water-cure establishment in which water is anything but scientifically applied.

THE WET PACK.

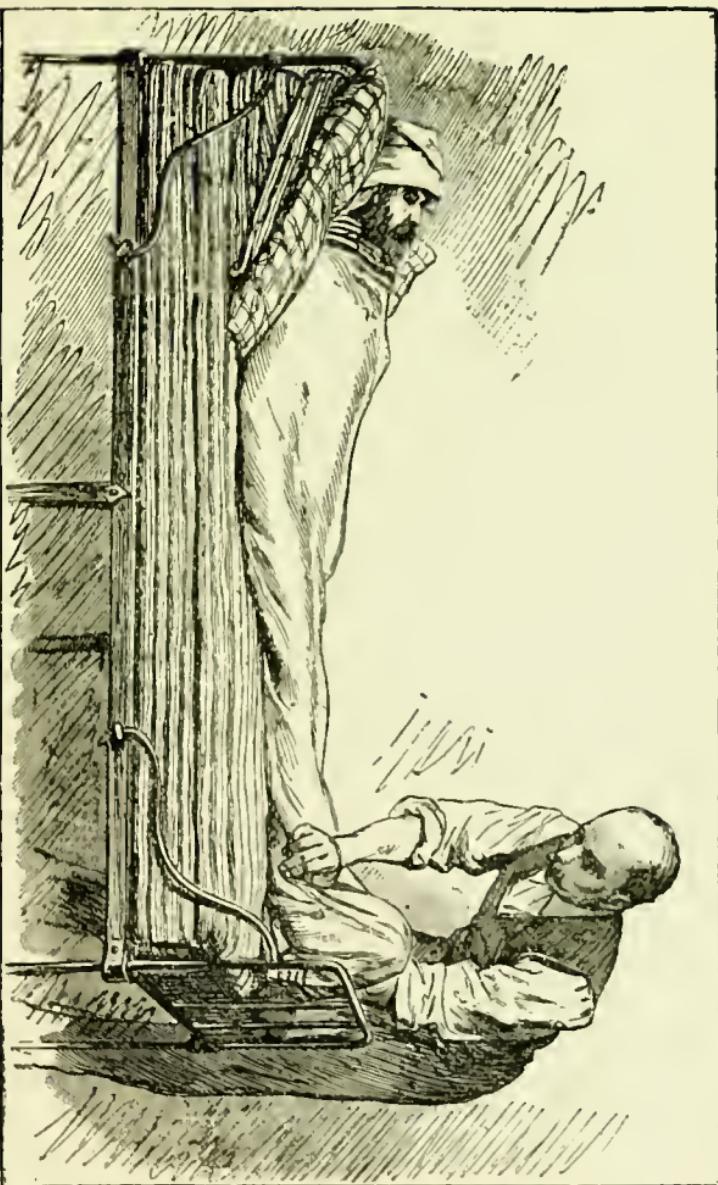
This procedure has been found extremely useful in acute and chronic diseases. It has been long established, but it is not, as is commonly supposed, an invention of Priessnitz, for it was first recommended by Lucas, an English physician, in 1750. Doubtless Priessnitz discovered it independently, for he was too unlettered to have been aware of Lucas's practice.

Like all other hydriatic measures, it requires great care and nicety in its application, if the results are to be adequate. The dread of a damp sheet is so intimately associated in the minds of the lay people with rheumatism and colds that the very name brings a shudder to the patient to whom it is novel, while, on the other hand, persons who are familiar with it abuse it by too frequent resort.

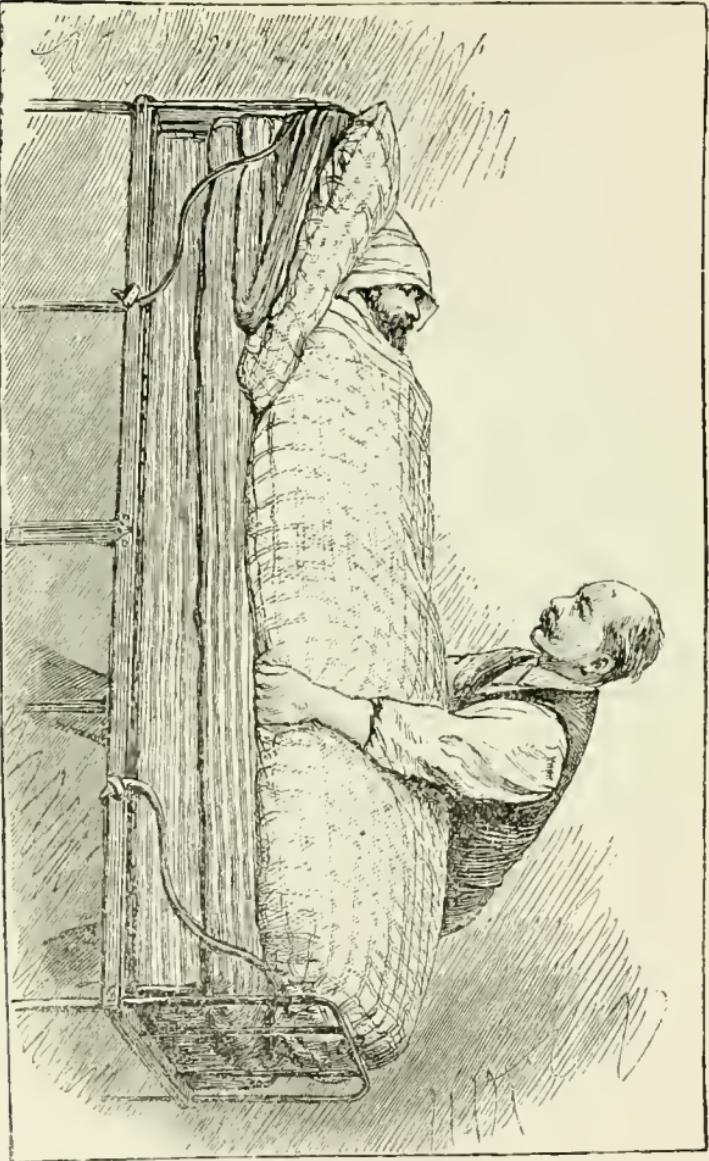
The technique is as follows: A large woolen blanket is spread upon a hair mattress, most appro-



Wet Pack—First stage.



Wet Pack—Second stage.



Wet Pack—Third stage.

priately placed (if a wire mattress is used, a rubber sheet must intervene to protect it from the moisture) upon a high four-legged cot. Upon this is spread smoothly a linen sheet, *well wrung out* of water at a temperature of from 50° to 70° F., appropriate to the case; the blanket should be long enough to extend two feet or more beyond the patient's extremities. The patient, with a wet cap upon his head, places himself upon the sheet—with his arms alongside but somewhat separated from the body—so that he occupies its middle. The sheet is now rapidly folded upon him in such a manner that folds of it are pressed alongside and separate the arms from the body, and are also placed between the legs. It is snugly secured around the neck and beyond the feet. The sheet should lie closely upon the chest, but must not embarrass respiration. The blanket is now drawn firmly from the left, and tucked under the right side of the body, the right border of the blanket being drawn over to the left in the same manner, firmly securing it under the body and around the neck, and folding it over the feet. *Everything depends upon complete exclusion of air from the blanket cover.* The patient is now covered with more woolen blankets, if necessary. If the covering has been skillfully done, the patient will resemble a mummy whose head is enveloped in a wet turban.

Modification of this procedure consists in half-packs, in which smaller or larger parts of the body

are enveloped in the damp sheet. The duration of the pack (which should be from one-half hour to an hour), the texture of the sheet, the temperature of the water and extent of pack, as well as the repetitions, modify the effect materially, as will be seen.

All wet packs must be followed by some hydriatic method which restores tone to the cutaneous vessels which have been relaxed by it. Either a half-bath, a sheet bath, or a cold ablution will serve the end, and these are selected with regard to the need of each separate case. One important element of the wet pack is the complete ventilation of the room during the time the patient lies in it, for reasons referred to below.

RATIONALE OF THE PACK.

The first effect of contact with the cold damp sheet is an irritation to the cutaneous nerves, which induces contraction of the peripheral vessels, and which continues until the individual's power of reaction comes into play. This depends, as in all hydriatic procedures, upon the age and condition of the patient; old people and children do not react as readily as adults, and a previous high temperature of the skin furthers rapid reaction, as does also a vigorous normal circulation. There being no mechanical aid given by the attendants, as in the sheet bath or half-bath, reaction depends entirely upon the vital powers of the patient. This fact distinguishes the

wet pack completely from all other hydriatic procedures, and demands judicious recognition of the patient's reactive capacity. As soon as the first shock is over, which lasts from five to twenty minutes and sometimes produces shivering, the peripheral vessels begin to dilate, and the system makes an effort to equalize the temperature between the skin and the sheet. When the body temperature is high, as in fevers, there is no chilliness, the cooled blood is driven from the surface to the subjacent structures, but very soon the warm blood from the interior takes its place, and dilatation of the vessels is the result. This continuous interchange of temperature, which occurs easily and slowly in patients with normal temperature, gives rise to a vaporization from the sheet, which, in fever, furthers loss of heat from the skin. This is increased by radiation from the blanket, and by the state of rest in which the patient is placed and consequent formation of a vapor which envelops the entire body and cannot escape it. This continues as long as the sheet remains cool, and just so long the thermic irritation is renewed, more feebly each time until the sheet is thoroughly warmed.

Max Schüller demonstrated the action of the wet pack upon trephined rabbits. He wrapped them in a sheet wet with water at 34° , and covered them with wax-cloth and woolen blankets, snugly tied up, so as to leave the head only free, and laid them for two or three hours upon the table. The temperature

sank one or two degrees, but began to rise again in $2\frac{1}{4}$ hours. The respirations became more slow and deep, and the pulse less frequent. The animals reacted less to irritants and seemed to be drowsy at first, but with the rise of temperature they became more lively and began to kick actively.

A striking effect upon the vessels of the pia mater was noted. After a rapid dilatation the vessels became narrower, the brain sank in more and more, and the dura mater was raised up by the cerebro-spinal fluid, which accumulated abundantly underneath it. The cerebral movements became more slow and more equable. This lasted several hours. External irritants, pinching, rubbing, or lifting the animals, produced at first rapid but afterwards more short cerebral movements and greater but changeable dilatation of the vessels. As soon as the pack was removed, dilatation of the vessels occurred, but they soon resumed their normal calibre. Respiration and cerebral movement became more frequent; warm compresses upon the belly and back of the animal produced a contraction of the vessels of the pia, with acceleration of pulse and respiratory movements—the former became less perceptible, the latter more shallow. These experiments render the action of the wet pack upon the human body intelligible. We often find the patient slumbering as soon as the temperature is equalized between the body and the sheet, and warmth is evolved by the reactive process.

If abstraction of heat is the chief aim, the temperature of the sheet should be 55° to 65° F. for the first pack; the patient must be removed from the pack when the latter is warm, and placed in another two degrees higher, which has been prepared on the same or on an adjoining bed. He is again removed into another of two degrees higher as soon as he warms the sheet and superincumbent blanket, which is ascertained by applying the hand to various parts. Liebermeister has shown that five such wet packs of ten minutes' duration will abstract as much heat as one full bath at 65° F. for fifteen minutes. When the temperature, therefore, is high (above 102°), or when insurmountable objection is made to other more or less heroic measures, the wet pack is a useful and acceptable alternative. It may be for the physician to decide whether he would prefer administering five packs, consuming fifty minutes' time, to a full bath of fifteen minutes. The character of the case will aid him in this decision. My own experience is in favor of the full bath, if the ablution and sheet-bath and half-bath have proved insufficient, and the proper help and tubs can be obtained. For mild cases, however, with temperature of 100° to 103°, especially cases of non-infectious type, the pack is an admirable antifebrile remedy. As it may be modified by repetition of sheets wrung out of water of higher temperature, each of longer duration, if the body continues to cool, or by lowering the temperature of the damp

sheet if the body temperature does not fall, we possess in the pack a most flexible remedy, subject to accurate dosage, as it were. Thus, in fevers, the first impression of cold upon the surface will cease abruptly and give way to the first-mentioned process of evaporat-
tion. This produces a soothing effect upon the peripheral vessels and nerves, and often produces sleep in patients who have been tossing restlessly before.

If this calming effect be the chief indication at that period of the disease, the patient having lost sleep or being on the verge of delirium, it would be wise to permit him to remain in the pack until he awakens, and then give him a cold ablution. If, however, the high temperature or depreciated nerve tone—adynamia—be the therapeutic indication, the patient should be removed from the pack as soon as the blanket or sheet beneath begins to feel warm. He should now be placed into another pack, as directed above, the process being repeated until four or five packs have been given or the temperature has been sufficiently reduced, precaution always being observed to permit him to remain in the last pack, which cools but does not chill him rapidly, for ten or fifteen minutes. If not too much fatigued, a rapid ablution with water at from 50° to 60° F. should be administered before he is again dressed. This method is slower, but its effect is more enduring, than the more rapid cooling by the full bath, for the reason that the compensating elevation, which is the normal conservative reaction, is more deliberate and tardy.

RATIONALE IN CHRONIC DISEASE.

If the body temperature is normal, or a little above normal, as is the case in most chronic diseases, the thermic irritation is the same as in acute diseases, but the response to it is quite different, owing to the usually depreciated nerve tone and diminished reactive power. The peripheral vessels are contracted; the patient probably shivers longer, because the surface is not so rapidly supplied with fresh blood and the latter is more readily cooled. In extreme youth and age the power of reaction to the thermic irritation is diminished. This also depends upon the more or less vigorous condition of the patient, and to a certain extent upon his temperature. The cooling effect lasts ten minutes or longer, during which time the patient feels somewhat uncomfortable, and often begs to be removed from the pack. The first impact of cold upon the surface, too, often produces gasping respiration and enhances the discomforts experienced. These, however, pass away more or less quickly. The equalization between the body temperature and that of the damp sheet, and the vaporization from the latter, envelop the body in a vapor of its own creation. The reactive labor thus involved is of great benefit to the circulation, and it has been demonstrated to aid in enhancing tissue metamorphosis. The patient, lying quietly in the pack, often falls asleep. Indeed, I have seen, at Prof. Winternitz's institution at Kaltenleut-

geben, numbers of patients soundly sleeping, although the packs are usually given before 7 A.M., *i.e.*, just after rising from bed. The calmative effect of an hour's sleep in a gentle poultice, as it were, is valuable in functional neuroses, hysteria, and some heart troubles.

In an able monograph on The Wet Pack and Massage, which is the only scientific contribution to hydrotherapy in this country, Dr. Mary Putnam Jacobi furnishes so intelligent and comprehensive an explanation of the wet pack that I reproduce it in testimony of my appreciation of this isolated contribution:

The increased production of heat, determined by the stimulation of the heart-regulating apparatus, irrespective of the amount of heat abstracted by the cold, involves functional activity (1) in the sensitive afferent nerves; (2) in one or more parts of the nerve centres; (3) in centrifugal nerve fibres of some kind terminating in muscles; (4) in the muscles where are performed the chemical processes involved in the production of excesses of heat. Thus the organism is induced to perform a definite and not inconsiderable amount of work. On this account its nervo-muscular tissues, or a large portion of them, are brought into a condition favorable to nutritive assimilation. But this is not all. When the reaction after the cold pack is normal, the column of blood which sets inward toward the chylopoietic viscera very soon turns outward again, accelerating the entire circulation of these organs in the same direction. As a most important result, more nutriment is carried into the general circulation, and with the abatement of the gastro-intestinal hyperæmia the appetite revives.

Sleepiness during the pack nearly always occurs in successful cases, and we have found the greatest benefit to accrue when the patient was able to sleep for half an hour after the completion of the pack and massage. If, during the first period of the pack, we may assume, for reasons already stated, that blood circulates in increased volume and under increased pressure through the nerve centres, and that, in consequence, the acid fatigue-products, which had been maintaining a permanent excitement of nerve elements, could be completely removed, the immediately subsequent diminution of blood supply, effected during the second part of the pack, cannot fail to be a great advantage, for it lowers the functional activity of the nerve tissues that has been unduly prolonged, and brings them, therefore, into the condition which is a necessary preliminary to the beginning of nutritive assimilation. The diminution of blood supply is not sufficient to interfere with this latter process, for it is not below the point which exists in sleep, the physiological period of the nutritive assimilation in nervo-muscular tissues. Accepting Ranke's law for these tissues, that they are only nourished when fatigued—*i. e.*, relaxed—we may see, further, in the muscular relaxation induced by the warm moisture of the pack, a condition most favorable for the nutrition of muscles."

The therapeutic application of the wet pack is extensive, being valuable in all chronic cases in which defective tissue metamorphosis is a prominent element, as in *diabetes*, *rheumatism*, *gout*, some disorders of the digestive apparatus, *anaemia*, and *chlorosis*. In functional neuroses the wet pack offers a means of allaying irritability, and if succeeded, as it should be,

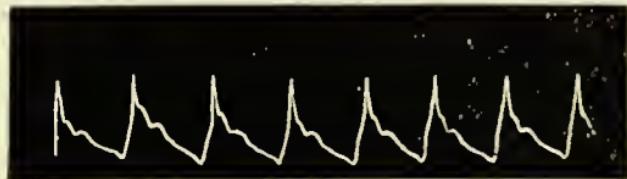
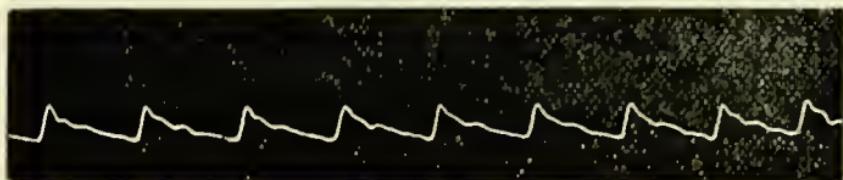
by a half-bath, douche, or other active mechanico-hydriatic procedure, it will refresh the nervous system, improve tissue change and the blood-making function, and invigorate the circulation. Thus, a combination of effects results which no other procedure is capable of furnishing.

In cardiac troubles I have found it of great value. I have now a gentleman of 65 under treatment for chronic valvular disease (mitral and aortic), with failing compensation, who has been entirely freed from a diabetes of fifteen years' standing. (The case will again be referred to.) It was with the greatest difficulty that I have been able to steady the heart with sparteine, digitalis, etc. Being previously prepared by ablutions, he reacts well in a pack of 65°, followed by ablutions of 60°, the pulse becoming steady and being reduced in frequency. The effect is doubtless due to the removal of impediment to the cardiac systole, which the large area of dilated cutaneous vessels produces in a subject suffering from atheromatous degenerations of the vessels.

In another case of functional cardiac trouble—Mr. C., sent me by Dr. B. W. Taylor, of Columbia, S. C.—the effect of this treatment is palpably evident in the subjoined sphygmograms.

The improved tension and increased force of the pulse are as evident as is the diminution of the pulse rate, which was taken immediately after entering my office, to which he walked two and a half blocks from

the station. This patient had been taking digitalis for a long time without effect.



CHAPTER II.

THE TUB BATH.

This is the so-called full bath of the Germans, by American physicians briefly termed "tubbing." It is the most complete method of bathing resorted to, consisting of an entire submersion of the body, with the exception of the head, the chin barely touching the upper surface of the water. As this procedure has been applied with notable success in the treatment of typhoid fever and other infectious diseases, a detailed description of the method and rationale demands attention.

The technique of this bath varies with the therapeutic object we have in view, as will be shown. The cold tub-bath is applied as follows: A tub of sufficient length and breadth to comfortably accommodate the patient, and filled to three-fourths of its depth with water from 80° to 65° F., is placed near the patient's bed, in acute cases separated by a screen, which prevents his being excited by the preparations. A double blanket is spread upon the side of the bed to be occupied by the patient when he has finished the bath, the pillow being covered by a towel. Upon the blanket is spread an old linen sheet (cotton is worthless, because it does not absorb water readily, and it is sometimes necessary, as will be shown, to let the patient remain in it without drying). Several hot-

water bags or bottles are also prepared for the feet, which are usually cold after the bath. The patient now receives a stimulant. He is undressed, and a light napkin is applied to cover the sexual organs. His face is now bathed with ice-water, and, if too feeble to step into the bath, he is lifted into it by two assistants. With the greatest gentleness and least fuss he is lowered into the water. He gasps and shudders a moment, or perhaps cries out. But gentle reassurance by word and deed, a calm demeanor, devoid of haste, and the absence of all actual force or argument to resist his natural desire to escape from the seemingly heroic treatment, will not fail to quiet his apprehensions. Friends or relatives must be kept out of the room, as their presence would increase the anxiety of the patient, and render him more resisting by injudicious and unavailing explanations. If an air cushion has been suspended over the head of the tub, it will afford a good resting-place for the patient's head, and a large water-cushion ring makes a comfortable support for his nates. In the absence of a head support, the nurse will hold it up with the left hand, while with the right gentle friction or chafing will be practiced over successive parts of the body. This may be done also by an assistant, who in private practice may be a member of the family or a friend. Care must be taken that every part of the body (except the lower part of the abdomen) receives the benefit of these frictions, *which are regarded as of supreme*

importance by the originator of this method in preventing chilling, collapse, cyanosis, and heart failure. The effect of the continuous gentle chafing is a suffused redness, which is in marked contrast to the previous death-like pallor of the surface, and demonstrates that the calibre of the superficial vessels is considerably enlarged. As this is being done in successive parts of the body, we really manage to maintain a constant contraction and dilatation of the peripheral vessels, the former being accomplished by the contact with the cold water in motion, the latter by the friction and its attendant reaction. Complaints of chilliness must not be regarded as an indication for removal of the patient from the bath, unless it be accompanied by decided chattering of the teeth; the former is voluntary and may be emotional, the latter is involuntary. A small pulse, a cyanotic or shriveled condition of the extremities, too, are regarded by the inexperienced as a warning signal to remove the patient from the bath. These symptoms may be due, it should be remembered, to the local action of the cold upon the superficial vessels, and need not be regarded as threatening unless the *face* becomes cyanotic. This, not being submerged, can only be rendered cyanotic by actual enfeeblement of the heart action, a condition which is exceedingly rare when the bath is administered *with friction*. That the small pulse is not an indication of heart failure, will be evident to the reflecting observer from the fact that it is much slower

and less compressible, having lost its dicrotic character. For this reason bystanders, who may be easily alarmed, must be excluded, or, if their presence and assistance be needed, the true explanation of these symptoms should be given them ere they occur. The duration of the cold full bath depends upon the object in view, which will be treated under the proper heads. Several times during the bath, which usually lasts fifteen minutes, a basin of water at 50° F. is gently poured over the patient's head, around which a handkerchief has been folded like a bandage, two inches wide, tied in a knot over the nucha. This forms a gutter, and prevents the surprise produced by cold water flowing over the face. If the patient is somnolent or delirious, cold water is poured over head and shoulders. The bath being finished, the patient is gently lifted out, the napkin covering the sexual organs rapidly dropped, and he is placed upon the previously prepared linen sheets so that the upper edge extends above his shoulders to the nucha. He is now carefully wrapped as follows:

Being laid upon the sheet so that his nucha touches its upper edge, the sheet is brought around the body, a fold being pressed in between the arms and the body and between the lower extremities, the object being to prevent the approximation of wet body surfaces. The blanket is now wrapped around the patient. If the temperature has been high, above 103° in the rectum, the patient is allowed to lie in the

sheet for five or ten minutes; if the temperature is lower, he should be at once dried with the sheet and afterwards with soft towels. In either case hot bottles are placed to the feet. Usually the patient who has been restless previous to the bath will fall asleep.

This is the ideal bath designed by Ernst Brand, of Stettin, for the treatment of typhoid fever, to which we shall have occasion to devote much attention. The technique has been rather minutely described because the author has seen it so frequently applied *without friction*, and otherwise improperly, and its success as a therapeutic measure depends upon its exact execution.

Another full bath that has received much well-deserved praise from clinical observers is the graduated bath, devised by Von Ziemssen, of Munich. This procedure is executed as follows: The preparation for bathing and drying the patient is the same as in the Brand bath. Water at 90° to 86° F. is poured into the tub until it is about one-third full. The patient being placed in it, the attendant bathes the body with the hand and sponge, while another attendant adds water at about 40° , at points where it does not come in immediate contact with the body, until the temperature of the water reaches 77° to 72° F. It will be necessary usually to remove some of the water from the tub by a faucet or pitcher while colder water is added. *Chafing is here also an all-important*

element of the bath. The only difference is that a gradual accustoming to the cold water seems less heroic to the patient and his friends, and the bath may be prolonged to half an hour. Indeed, this is the time required by Ziemssen for this bath. When it is finished, the patient is wrapped in a previously warmed woolen blanket without being dried, for a quarter of an hour, and then dried, and his clothing replaced.

The rationale of these cold full baths, which have been chiefly applied in typhoid and other infectious fevers, is so exact and scientific that it must lend firmness born of conviction to the attendant who applies them with a clear understanding of their aims and capabilities.

What are the indications for treatment in a case of typhoid fever, for instance? Here we have an infective process due to some cause which is beyond our control, which manifests itself by the following conditions, against which we must do battle if we would rescue our patient from its grasp:

1st. The nervous system manifests, almost from the beginning, decided and serious depreciation, due doubtless to the specific infective agent. An indefinable malaise is followed by ataxia, general lassitude, somnolence, and other adynamic manifestations, which culminate in stupor, delirium, and coma, subsultus, tremor, etc.

2d. The heart, being called upon to do extra

duty, threatens to fail, and often does fail, not owing to the elevated temperature only, but to a paralytic condition of the capillary circulation, induced by the infective process, which embarrasses the peripheral vessels.

3d. An elevated temperature renders the patient uncomfortable, deprives him of sleep, impairs his organic functions; all of which difficulties, if prolonged without remissions, will sooner or later lead to serious if not fatal results.

1. We place the effect upon the nervous system above all others. Though gradual and insidious in the beginning, the manifestations arising from a depreciation of the nerve centres never escape the experienced observer; indeed, they are the most uniform characteristics of typhoid and infective fevers. Only one observation will be quoted in support of this view. Dr. Edward Delafield says, in a paper on Typhoid Fever, read before the Academy of Medicine, and published in the Medical Record, Nov. 12, 1883, in referring to the reliability of symptoms in the diagnosis: "A study of all the temperature curves shows that we must not expect too close a correspondence with the schematic curve." In contrast with the unreliability of other symptoms, he mentions that "the appearance of the patients was characteristic. A dull, apathetic expression, the skin of the face dusky-colored, the cheeks often bluish, the mind dull and sluggish, all the conditions were well marked. In only

one case were these symptoms notably absent." These symptoms are the expression of a depreciated condition of the nerve centres, which in typhoid and similar fevers is the leading point of attack, and must, therefore, be the leading point of defense. From it originates a condition of the circulation which, by its effect upon the peripheral vessels, not only disturbs heat radiation, and thus develops temperature elevation, but later in the disease gives rise to other most threatening conditions, failure of the heart, local hypostases, bed-sores, etc.

2. That the elevation of temperature is not due to the fact that heat radiation alone is interfered with, has long been held. Even Galen suspected that a spasmotic condition of the blood-vessels supplying the skin might be the cause of fever, by retention of heat in the body. Cullen and the physiologist Henle held similar views. But it remained for the great clinical teacher, Traube, to demonstrate that the rise of temperature is the direct result of the contraction of the peripheral vessels, by showing that a chill, with its consequent cutis anserina, is always accompanied by a rise of temperature. But, as the rise sometimes precedes the chill, this doctrine proved defective, until Maragliano demonstrated by means of Mosso's plethysmograph, which shows with the greatest precision the slightest change in the volume of any part, that the blood-vessels begin to become narrower in the stage of invasion of fever, before a rise of tem-

perature may be recognized, that as this vascular contraction continues the temperature begins to rise, and that chill ensues after both have continued for some time. He also showed that the maximum rise of temperature coincides with the maximum contraction of the blood-vessels. The proving of this proposition is made complete by the observation of Bettelheim in Von Basch's laboratory, and confirmed by Geigel, that the reduction of temperature produced by antipyretics is always accompanied by dilatation of the cutaneous vessels, which increases heat loss, and that a new exacerbation always is initiated by a renewed contraction of the peripheral vessels.

This view has been always persistently advocated by Winternitz, even when Pflüger, Zunz, and other men of eminence opposed it and sought to overthrow it. Liebermeister, for instance, attempted to show that heat regulation was chiefly induced by heat formation, citing as plausible evidence of his proposition that his chemical examination had clearly proved that, whenever heat elimination was obstructed from the surface of the body, there was noted a proportionally increased elimination of CO_2 , which was sufficient to maintain the temperature equilibrium if the heat abstraction were not excessive.

The physiological fact above referred to, established by the exact experiments of Maragliano, has been clinically demonstrated by Winternitz's able assistant, Dr. O. Pospischl, who showed that mechanical

irritation of the skin is capable of increasing heat loss 95 per cent., as will be shown later. It is impossible, too, to account for the sudden and enormous reduction of temperature we so often observe in the crisis of diseases upon the theory of diminished heat production. We can more easily account for it by the great increase of heat elimination which Pospischl has shown to be possible.

Moreover, the idea that the increase of CO₂ during surface heat abstraction is an evidence of an increased internal heat production is disproved by the recent experiments of Speck and Loewy in Zunz's laboratory, who demonstrated with precision that heat abstraction produces an increased CO₂ elimination only when voluntary or involuntary muscle actions are not avoided. Loewy says that his experiments on heat regulation have definitely settled that the first result of an irritation due to cold is a contraction of the skin and its vessels, which by the restriction of moderate heat diffusion affords a complete compensation, but in intense heat abstraction only an incomplete compensation occurs. Hence, in the first case the temperature remains the same, while in the last it is lowered. Change of heat production may be added by reason of chill or muscular contractions, due to involuntary tremor, which, however, are of far less importance in the heat regulation than the action of the skin. Winternitz may well point with pride to the confirmation of the theory of fever production and fever treat-

ment which he had advocated for twenty-five years in opposition to some of the best pathological experimenters.

This explanation of fever genesis becomes of immense importance, not only in the question of heat elevation, but even more decidedly in its treatment. It makes the reduction of elevated temperature by the bath a strictly scientific proceeding. Rosenthal, Leyden, and Botken have clearly demonstrated that in many forms of fevers the rise of temperature may be traced as above stated to a diminution of heat dissipation from the surface, which results in actual retention and accumulation of heat in the body. These and other investigators have also shown that the evaporation from the surface is inhibited. Now both of these direct factors of temperature elevation are simply and scientifically removed by hydriatic measures. It is the chief object of the latter to improve the tone of the superficial vessels, to *actively* dilate them, and thus increase the heat dissipation, as has been again and again demonstrated by Winternitz and others; and also to increase the elimination of water from the surface.

Here we are met at once with the importance of precise attention to the method of bathing. To immerse the patient in a full bath of low temperature, or to wrap him in ice-sheets, as has been done in some hospitals, would result in closing the superficial vessels and keeping them closed. If such treatment

does not induce collapse, reaction may slowly take place, and the former high temperature is again reached or exceeded. If, however, the patient is carefully placed in a bath of 65° to 70° F., and constant and unremitting gentle friction is practiced over the entire body, the coats of the superficial vessels are stimulated, reaction from the first shock ensues, the vessels contract rapidly and dilate actively, as the ruddy condition of the skin which has been subjected to friction testifies. This condition is maintained by an occasional basin of cold water poured over the neck and shoulders, followed by friction. The mechanical irritation not only removes the obstacle to heat dissipation, but, as Weyrich has proved by an exact experiment, it increases the elimination of water from the surface 60 per cent. Moreover, the cooled blood is sent from the dilated vessels back to the interior of the body, and thus a direct cooling effect is produced besides. The baths, therefore, when combined with friction and douching, fulfill both indications for removing high temperature, while medicinal antipyretics fulfill only the first—heat dissipation.

EFFECT UPON THE HEART.

The enfeeblement of the heart power also may be shown to be the result of loss in tone in the smaller vessels, which Marey and others have termed a paralysis of the muscular coats of the vessels, and later to parenchymatous degeneration due to the in-

fective process plus high temperature. As Winternitz has so ably shown, we have here an imitation of Golz's experiment on frogs, which demonstrated that a loss of tone in the vessels of a large area of the circulation and a diminution of the tension in these vessels enfeebles notably the action of the heart. That we possess in a cold bath, combined with friction and gentle affusion, an effective agent for the restoration of the lost tone of the coats of the vessels, is proved by the exact experiments of Delmas and Winternitz; and that this effect, together with the reflex stimulus conveyed to the nerve-centres governing the heart from the peripheral cutaneous nerve-endings, refreshes and invigorates that organ, lessens the number and increases the force of its contractions, and prevents dicrotism, is positively demonstrated by tracings taken by the writer with Dudgeon's sphygmograph. In order that the tonic effect upon the heart may be continuous, it is important that the bath be repeated at sufficiently frequent intervals (three hours having been ascertained as the proper average). The effect upon the heart and vessels must be watched.

In the early stages of typhoid fever, when reactive power has not been much enfeebled, chattering of teeth, facial pallor, and a small pulse ensue later than in the more advanced stages. But these must not deter us from continuing the bath; they demand increased friction of the surface, and perhaps a little alcoholic stimulant. If superficial hyperæmia is read-

ily induced by the friction, a small pulse or even a pinched countenance does not demand removal from the bath. Only decided chilliness and prolonged chattering of teeth are indications to remove the patient, because the muscular contractions incident thereto induce, as Speck and Loewy have shown, increased oxidation, which must be avoided here.

Sphygmographic tracings I have been unable to obtain after the bath, on account of trembling of the patient, but positive evidence of the improved condition of the pulse is found in the fact that, while it feels small and almost thread-like, it has gained in force and tension, and continues to so gain until the good effect of the bath passes away. It becomes far less compressible, and slower, almost invariably. In advanced stages the effect of the cold bath is not so pronounced, because the reactive power is more in abeyance if baths have not been used in the beginning. In the third or latter part of the second week of typhoid, either higher temperature (75° to 80° F.) or more brief application of the bath (65° to 70°) is indicated, always bearing in mind that the *rapid application of a low temperature is more refreshing and stimulating, though not more heat-reducing, than the prolonged application of a higher temperature.* The reverse idea, though erroneous, seems to be so well established in the lay as well as in the professional mind that it is difficult to dislodge it.

In the discussion of the best temperature-reducing

baths known to hydrotherapy, this subject will be so clearly brought out that I trust it will demonstrate the error that "*the colder the bath the greater the reduction of the temperature.*" This erroneous idea has been the cause of numerous disputations between the adherents of Liebermeister and those of Winternitz. Voit, to whom we owe so much in connection with the study of the physiology of heat regulation, has demonstrated that an increased tissue metamorphosis does follow the application of cold, amounting to as much as 40 per cent., but that no rise of temperature can be produced in this way if we do not have a simultaneous disturbance of that greatest heat-regulating organ, the skin. If a patient with a temperature of 104° F. is placed into a bath of 65° F., and allowed to remain there until he shivers, the skin becomes more contracted, and thus heat elimination is really prevented. The tremor will, to a certain extent, add to the increase of inner temperature by producing heat, as shown by the experiments above referred to of Speck and Loewy. How different will be the effect of a regular *Brand bath, with frictions*, must be seen to be appreciated. As previously described, the cutaneous vessels are dilated, and more cooled blood is carried to the interior, to be exchanged for hot blood. On the other hand, if a nerve or heart stimulus is the chief object of the bath, a brief application of cold with mechanical force to the surface, as described under the head of half-baths, produces a reaction

which does not, unless prolonged, affect temperature so decidedly (because the blood has not been exposed to the heat-lowering influence sufficiently long), but, by exciting the reflexes, brings the blood to the surface, deepens the respiration, and invigorates heart action, as shown above.

THE WARM TUB-BATH.

The warm bath, consisting of water at and above the body temperature, is so familiar that it requires only mention in connection with the full bath. Its technique is simple, the chief point being that the patient is entirely submerged in the water, except the head. The rationale of such a bath of a temperature from 90° to 100° has been studied by Max Schüller on rabbits which he had trephined. He found that if the body were immersed in warm water a decided contraction of the pia mater ensued, and that the contraction remained for some time. The well known hypnotic effect of warm baths is thus explained. But, aside from this direct effect upon the cerebral circulation, there is a direct local effect upon the peripheral cutaneous nerve-endings, which has been studied by Heymann and Krebs, and recorded in Virchow's Archiv, Bd. 1, Hefte 1. They claim that the peripheral terminal ends of the nerves of sense are the media through which exciting or soothing effects may be produced. They claim that these nerve-endings are rendered succulent and become blunted. They

present quite an array of data to demonstrate that the slow imbibition of water reduces nerve irritability, while its withdrawal increases it. Krause's end-bulbs of the nerves of sensation, as well as Meissner's bodies, may absorb water endosmotically, and, even in the absence of direct absorption of water, they may become succulent by the cessation of insensible perspiration in the lukewarm bath. That the cerebral condition may be influenced by the local state of the nerve-endings is a physiological fact, clinically verified by the effect produced by the warm bath in cases of eclampsia or other conditions of excessive nerve irritability. Heymann claims that the cessation of cerebral disturbances when the skin perspires may be fully accounted for by this blunting of the nerve terminals through their increased succulence.

CLINICAL APPLICATION OF THE WARM TUB-BATH.

In the pyrexia of infants we have in the warm baths a potent means for reducing the temperature, assuaging pain, and relieving nervous irritability, without materially interfering with any of the functions. In this day of facile resort to antipyrin and its congeners, the following large statistical evidence may be of value: In the *Jahrbuch für Kinderheilkunde* (xxxii, 142) Eroess reports the results of his observations upon the use of antipyrin, quinine, and warm baths in the pyrexia of very young infants: "Among 431 cases of fever during the first ten days after birth,

145 were of short duration, the remainder continuing for several days; in 184 it was continuous, and in most of the others irregular. In 44 per cent. it was attributable to gastro-intestinal disorder, in 34 per cent. to some disorder connected with the navel. Antipyrin was given in doses of from 1 to $2\frac{1}{4}$ grains, repeated, if necessary, in an hour. The effect was good, as was that of quinine. *Better results were obtained from the warm baths than from either drug.* The temperature of the bath was 95° ; duration, ten minutes; in weakly children, five minutes. Upon the general condition the result was very satisfactory. Sleeplessness and irritability usually disappeared, and the child fell into a quiet sleep, from which he awoke apparently improved. When the temperature is very high, a warm bath is an agent of the greatest value." The author has in this case followed the plan adopted throughout this work, viz., to summon large statistical evidence, whenever possible, to substantiate his position with regard to this much neglected remedy.

Reference to an *irrational application of the warm bath* may not be out of place here. In the convulsions of children the practice of plunging the struggling patient into a hot bath is as reprehensible as it is antiquated. Indeed, ere the excited attendants, who rush hither and thither for the bath implements, succeed in placing the infant into it, the attack is usually subsiding. It is this coincidence which has maintained the reputation of the warm bath in these

cases. Chloroform inhalations are far more effective, if the attack be prolonged. It behooves physicians to discountenance this irrational bathing, which but adds to the excitement and trouble incident to such occasions.

Diseases of the Liver may be favorably influenced by warm baths. Roehrig has shown (Med. Jahrbücher, 1873) that application to the cutaneous surface may affect the portal circulation; irritating influences acting upon the skin are capable of producing temporary anæmia of the liver, and even cessation of bile secretion. Upon this principle, a bath which produces turgescence of the entire cutaneous area must be an active therapeutic agent. F. A. Hoffman, of Leipsic, claims that, although the ordinary warm bath does not act so energetically upon the liver, its effect is more protracted. In icterus he has used warm baths frequently, originally with the idea that accumulated bile elements might be eliminated by the kidneys and skin. These baths were so very grateful to the patients that he thinks no one should be willing to deprive himself of this valuable therapeutic factor in the future. He esteems the daily lukewarm bath as highly for liver cases as for those involving the kidneys, and he regards them as a necessary habit.

In kidney affections we have the testimony of this clinician to the value of the warm bath. He says that at the Dorpat clinic he ordered almost every

kidney patient a daily warm bath, and that he was convinced of its favorable effect. Since he adopted this course, he claims, he has had no uræmia. Although the number of cases was small, he cites this as a valuable clinical fact. It is impossible to explain this effect upon the renal circulation with exactness, but it is probably due to reduction of blood-pressure in the kidneys and the consequent dilatation of their vessels. Without being able to explain the rationale, the empirical fact is demonstrable that an indifferently warm bath is a means for sparing labor for the kidney. A temperature of 104° to 106° is the most agreeable for these patients. (According to Lehman, a bath of 95° increases the urinary secretion most.) By friction in the bath, and subsequent rest in bed, the relaxing effect of the bath on the superficial vessels and consequent sense of coolness and malaise may be avoided.

In anaemia complicating obesity, Hoffman recommends warm baths as the chief remedy for withdrawing water from the system, which may be done surely, and be regulated by the power of endurance of the patient. The ordinary warm bath competes here with the more energetic hot-air and Russian bath. Kulon calculated, while treating a corpulent patient, that between 400 and 700 grammes of water were lost in a bath of half an hour at 100° to 104° .

In cardiac affections the warm bath is usually regarded as contra-indicated, but the injurious effects are often due to improper execution of the bath. It

should not be of so high a temperature as to heat the blood; nor should the patient dress in the room in which he has bathed, and which contains much moisture; nor should he make great efforts in drying or dressing himself. Hoffman says justly that all these faults may be avoided, if the pulse and temperature are watched. With due regard to these precautions, the warm bath is an excellent remedy to regulate cardiac action, and a method of saving heart labor which has a great future, because it may be continued indefinitely.

An unavoidable danger from the warm bath lies in its action upon the skin. The perspiration is greatly increased, the epidermis becomes succulent and better adapted for giving off watery vapor; hence there is a tendency to cooling off after the bath, which may amount to a sense of chilliness. A rapid contraction of cutaneous vessels takes place. Thus, while it is our desire to relieve the heart, these decided variations in blood-pressure make an increased demand upon it. If, to avoid this, we carefully cover the patient, we incur the danger of fixing upon the cutaneous surface a layer of air which is saturated with vapor, which maintains the dilatation of the cutaneous vessels, and justly inspires the patient with the fear of taking cold. The tone of the vaso-motors is diminished in these persons. Under normal conditions the vaso-motor system provides for the correct division of blood in the whole body, preventing excessive con-

traction as well as dilatation. This equilibrium is disturbed by the warm bath, and a certain period is necessary for restitution of the normal tone of the surface vessels. In the healthy heart a cold affusion readily promotes the latter. But this cannot be regarded as a quieting procedure in abnormal cardiac conditions, and is only advisable in persons having vigorous hearts. Hence it becomes important that the patient's cutaneous vascular tone be restored gradually. This may be done by rendering the skin slowly more bloodless by means of gradually drying with warm cloths. This may seem a trivial matter, but just such trifles render treatment effectual or harmful. Moreover, too active friction should be avoided in these cases, and woolen clothing should be worn. The latter not only protects the skin, which has been rendered tender and sensitive by the warm bath, but encourages by its roughness a certain amount of hyperæmia, which conduces to an increase of vascular tone. In advanced conditions of cardiac disease, still greater care is necessary in the use of warm baths. So long as there is no venous stasis, they may be used with advantage.

CONTINUOUS WARM BATHS.

Upon the theory of Heymann, referred to, may be explained the remarkable result obtained from these baths by Langenbeck (*Deutsche Klinik*, 1885, No. 37) in extensive burns and in after-treatment of

amputation, and by Zeis (in No. 40, Deutsche Klinik), who gives excellent results in the treatment of contused wounds, and, as referred to above, by Hebra and Kaposi, who applied the continuous baths in pemphigus foliaceous and pruriginosis.

The preparation of such a bath requires some skill. A large tub is arranged so that the temperature of the water may be maintained at a comfortable rate. This may be done by connecting the bath with the hot and cold water supply-pipes. By suspending a strong sheet within the tub in the shape of a hammock, and placing a rubber pillow under the head of the patient, he will be enabled to lie comfortably and to change his position. The tub should be covered with a blanket and rubber sheet, which are supported by light bars lying across the edges. The temperature of the water should be agreeable to the patient; the duration of the baths brief at first and gradually prolonged, and mostly omitted at night. The skin will become puckered, and may peel at first. This effect may be prevented or modified by anointing the patient before the bath, when he soon becomes accustomed to the change. A valuable contribution to the utilization of these prolonged baths was made by Dr. L. Riess, of Berlin, who applied them in acute as well as in chronic cases. There is no doubt that in acute disease the bath originated by Reiss of 25° R. ($88\frac{1}{2}^{\circ}$ F.) *is the most efficient antithermic bath we have.* It will be noticed when we reach the discussion of the bath treatment of typhoid fever.

But the calming effect of the bath has been utilized by Riess in the treatment of over 1,000 cases of various types of brain and spinal diseases. There is no thermic effect upon the cutaneous nerves, no change of temperature, blood-pressure, cardiac action, or respiration—only a calming effect, due probably to the removal or diminution of the usual cutaneous irritations which ordinarily are conveyed to the internal organs, especially to the central nervous system. Cases of serious disturbance of the latter thus become amenable to treatment. Riess has treated paraplegias of the lower extremities, paralysis of the bladder, intestines, etc., occurring in tabes, myelitis, and similar diseases, which usually demand the use of the bath for the greater part of the day on account of the bed-sores. The latter usually healed very rapidly, if not too far advanced. But, in addition, many symptoms, such as local spinal pains, excentric pains of the extremities, distressing contractures, reflex convulsive movements, were alleviated. In similar manner these permanent baths acted in cerebral trouble, apoplexy with chronic meningitis, hemiplegias, and with unilateral contractures also, and upon general hyper- or an-aesthesia, cerebral excitement and delirium, in the most favorable manner. The calmative influence exerted by neutral baths upon the condition of excitation of the brain is the chief basis of the therapeutic effect in these nervous diseases. The regulation of the peripheral irritations alone

seems to suffice for the explanation of the effect. Especially is the relief of insomnia a marked result of these baths. But Riess was not content with the improvement of a few leading symptoms. His observations, made in the course of twelve years in the Berlin City General Hospital, refer to a retrocession of the pathological processes, whenever this was still possible. In not a small number of cases of disease of the brain and spine, treated for weeks by permanent warm baths, a decided improvement of the diseased condition was noted. Motor and sensory paralysis, ataxia, and related symptoms yielded in these cases, after failure of other treatment. In cases amenable to improvement, namely in the initial stages of inflammation and absorbable exudations, the bath appeared to contribute to the cure, just as is the case in the mineral baths, which have been known to produce remarkable change in such cases where prolonged sojourn in the waters was practiced. Riess gives the history of a case of compression myelitis, in which the patient spent the whole day in the bath, the night in the bed, and which resulted after 8½ months of constant treatment in complete restoration of the function of the cord !

In cases of cystitis the treatment by irrigation is much more successful when combined with the bath. He mentions five cases, of which three recovered. In five cases of obstinate sciatica he succeeded in curing them. In chorea he obtained partial results. Pains

of multiple neuritis were relieved. In anasarca, due to heart and kidney trouble, he obtained especially good results, although in these cases there was a decrease of urine; this bath should, therefore, not be used when the urine is scanty. In several obstinate cases of articular and muscular rheumatism, in which all other treatment had failed, he obtained good results from daily baths of twelve hours' duration. In almost all cases he obtained an improvement of the general nutrition. Diarrhoeas especially seemed to improve. There were no disadvantages from these baths in properly selected cases. Patients soon got accustomed to them, when they realized their calming and hypnotic effects. Realizing such results from so reliable a source, the baffled attendant may find in these prolonged baths a resource of incalculable value after all other measures have failed.

PEMPHIGUS.

The prolonged warm bath was introduced by Hebra for the treatment of pemphigus foliaceous, a disease which resists all remedies. Kaposi speaks of this bath as an inestimable protective remedy, which furnishes the best relief for the pains, fever, and loss of sleep and appetite during the eruptive period, to which the patient must otherwise succumb. Kaposi has saved a patient by one of these baths for four years. It was used continuously, with the exception of brief intervals; once he continued in it with great benefit for eight months, night and day.

In extensive burns, Langenbeck and Hebra have brought this continuous bath into effective use. When there are large suppurating surfaces, the exclusion of air and constant cleansing of the parts by this immersion must serve to further healing. In these desperate cases vast suffering will be saved to the patient, and much trouble to the attendant.

LOCOMOTOR ATAXIA.

In this obstinate and unsatisfactory disease, the large number of medicinal agents recommended demonstrates our therapeutic helplessness. We must agree with Prof. Leyden, who says (*Internationale Klinische Rundschau*, 1889) that, while medicinal agents only serve to infuse hope into the desperate patient, warm baths belong to the most important therapeutic methods in tabes, and their correct and careful application is of the greatest importance. While they cannot be credited with curing the disease, they produce a beneficial, quieting, tonic influence. Patients must be warned against too great numbers of baths, and against excitement from too high temperatures or strong salt or CO₂ ingredients. The baths should be given with the greatest care and comfort, to avoid taking cold or being otherwise injured. The temperature should be guided by the season of the year and the individuality of the patient (86°–92°–95° F.), and the duration should be five, ten, or twenty minutes, according to the effect. The latter may be ex-

pected to manifest itself in improvement of strength, calming of pains, and mild excitation of the sensory nerves. It is possible also that the baths may exert a favorable influence upon the degenerative process, and effect its cessation. Simple warm baths, without any or with very little addition, are most appropriate in the initial stages. Vapor baths, though useful in these, are objectionable in the chronic stages.

From personal experience the author can corroborate these wise directions of Leyden regarding baths in tabes, and they apply with equal force to other chronic degenerative nerve lesions.

In no form of disease need skill and judgment be more carefully applied to the relief of suffering. A careful consultation with someone familiar with hydrotherapy is regarded as valuable, even by such men as Leyden, Erb, Binswanger, and other nerve specialists, who habitually send their patients to hydrotherapeutic establishments which are under the management of educated physicians, to whose judgment, rather than to their own, these eminent men prefer to entrust the hydriatic treatment of the cases.

CHAPTER III.

THE DOUCHE.

This is a method of applying water in a more or less concentrated form, without direct intervention of an assistant, its chief element being the use of a certain amount of force derived from atmospheric pressure. The hydriatic procedures hitherto described were executed by an assistant, whose hands applied the water directly or through the medium of a sheet to the body. The douche is the only procedure in which the mechanical effect is brought about without the intervention of a second person, who is replaced by the force derived from atmospheric pressure.

The origin of the douche may be traced as far back as the Roman Empire, when it was known as *balneum pensile*. The first time the term douche is encountered in literature is in the writings of Pietro Toussignano, who described the baths of Bornio in 1336.

The modern douche employs the valuable mechanical contrivances by which water is delivered under great atmospheric pressure from a reservoir, which in cities feeds the ordinary water supply, or into which it has been pumped. The French have improved this hydriatic procedure, and really have made it the chief among all. Charcot's name is well known as connected with this application, because his

phenomenal success in utilizing the valuable knowledge acquired by his countryman Fleury and others in this branch of the art has added to the great fame he has justly acquired as a diagnostician and practical neuro-therapist.

Hydrotherapy is—as the French, represented by Duval, who is the most voluminous author on the subject, term it—a perturbating action. This disturbing effect, produced by the more or less violent impingement of water upon the skin, is due to the same elements which in other procedures have been shown as necessary for the evoking of reaction, viz., the mechanical and thermic. The mechanical effect is enhanced by the height from which the stream falls and the size of the outlet.

In Germany the shower bath and stationary douche are used a good deal, while the French have improved upon this by adopting the *douche mobile*. The latter is a nozzle connected with the pipe at the outlet of the reservoir, by means of a flexible rubber hose, which enables the attendant to direct the stream upon any part of the body. The size of the stream may be modified by various nozzles screwed upon the hose; giving either a fine jet, whose diameter may be so small that it may perforate the skin under great atmospheric pressure, as in the *douche filiforme*, or so large that it strikes the body like a flexible hammer, or in numerous fine streams at once from a sprinkler. The thermic effect may be modified by the temperature of the water issuing from the nozzle.

The douche differs from other procedures in this respect: it may be administered at a lower temperature, because the mechanical effect is simultaneous, and thus enhances the rapidity of reaction.

Here, too, the law referred to above is fully exemplified, viz.: The colder the water and more brief its application, the more complete the reaction. As we are enabled by the douche to overcome the paralyzing effect of any low temperature by the stimulus of the mechanical effect, we possess in this procedure the most powerful therapeutic weapon. This explains the great success of the French with the douche.

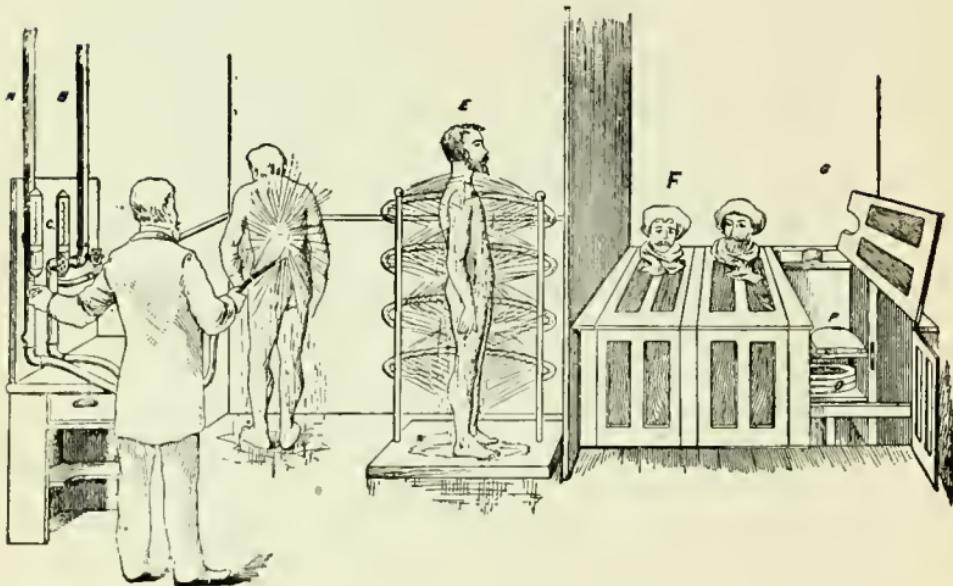
There are other advantages connected with it. The brevity of its application, which should never, at low temperature (below 55°), exceed one minute upon any one part, saves much time and renders it much less disagreeable. The cold is not felt as a painful impression, as would be the case were the individual immersed in a tub of water at the same temperature. The rosy hue of the skin, which frequently ensues immediately upon the impingement of the douche, indicates at once that the chief end of hydrotherapy is being met, viz., reaction. The rationale of the douche may be explained upon the general principles laid down in the first part of this work, and need not be reiterated here.

It is only necessary to dwell upon the fact that every physiological indication is fulfilled exactly. The nervous centres are aroused, the respiration is deep-

ened, the circulation invigorated, the secretions increased. The local action of the douche is also valuable. It is practically a thermic massage. It excites intensely the neuro-vascular structures; hence it is an admirable sorbafacent of pathological products. In the form of the Scotch douche, which consists of alternating streams of hot and cold water, it is specially applicable in the latter. Its effects are enhanced, as in other procedures, by preceding applications of warmth, with or without moisture. The French are fond of using the hot-air box bath; the Germans prefer the dry pack, by which the sensitiveness of the skin is enhanced, as in other procedures, and with it the reactive capacity.

The apparatus illustrated on page 70 was designed by the author, and constructed under his supervision for the Montefiore Home by the Mott Iron Works of New York. The drawing—reproduced from an electro kindly furnished by Lea Bros., of the illustration on page 503, Vol. I, American System of Therapeutics—furnishes a bird's-eye view of the apparatus on the left. The water supply comes from the Croton service, with a pressure of 32 pounds to the square inch, as registered by a gauge in the douche-room. There are three sources of supply to the latter—hot, cold, and iced water, the latter being necessary in summer, when the Croton water registers as high as 80° sometimes; it is obtained by passing the water through galvanized iron coils lying at the bottom of a

water-tight wooden box, and protected by wooden slats, which separate the coils from a quantity of ice lying above it. Thus all the water passing through this coil is rapidly cooled, so that the lowest tempera-



tures required may be obtained during the hottest weather. In order to compensate for the loss of pressure by friction in the coil, this supply was connected with the high-water service, which furnishes a pressure of 40 pounds, equal to a fall of 80 feet. This may be diminished by reducing the volume of water by the stop-cock. The pressure here is ample, being greater than in any of the Parisian institutes, six of

which I have inspected. The highest fall claimed there is in Duval's Institute, rue de Dôme, 60 feet.

The floor of the douche-room is covered with asphalt, upon which movable slatted frames are placed to prevent chilling the feet. The walls are constructed of marble slabs eight feet high.

At the Hydriatic Institute, constructed for private patients, at 635 Park avenue, the douche-room is 12x18 feet. The walls, lined with marble, are eight feet high. The floor is of wood, covered with zinc plates, with a graduated fall toward the front edge, which contains the outlet to the sewer. This floor is covered by a slatted (movable) floor, upon which the patient may stand without becoming chilled, and through which the water flows off readily. Near the distributing-pipe stands a counter or table. Behind this the nurse or physician giving the douche may stand protected against the return spray. At the upper end of the douche space, on the left, stands the rain bath. This is a modified douche, consisting of a combination of four circles of inch pipes, nickel-plated, about three inches apart. These are perforated by three rows of fine apertures, the upper row directed downward, the middle forward, and the lower upward. This is connected by an inch pipe with the distributing apparatus which the nurse controls. The patient, standing within the circle, receives a large number of fine streams of cold water simultaneously. Ice-water is furnished by a separate pipe coming from two gal-

vanized iron boilers covered by several tons of ice in an ice-box. By a waste arrangement the pressure of the water may be diminished or increased while it is being registered on the gauge.

The therapeutic indications of the douche are numerous. By variations of temperature and pressure, by changing the aperture of the nozzles, by increasing the number and form of the streams, as in the spray and fan douche and rain bath, the mechanical effects may be as materially modified as the thermic effect may be by increasing or reducing the temperature of the water. As a general invigorant the douche excels all other procedures in cases in which muscular energy is in abeyance, whether the loss be secondary to other conditions or primary. The experiments of Maggiora and Vinay (detailed in *Blätter für Klinische Hydrotherapie*, January, 1892) show clearly that a rain douche of 50° F., under a pressure of two atmospheres, increases threefold the sum of work the muscles are capable of doing. The Scotch douche, oscillating between 98° and 53°, doubles the capacity of the muscles. Even douches of tepid water increase the number of muscular contractions and amount of actual work of the muscles, while a tub bath of the same temperature is without decided effect.

These experiments were made with the Ergograph of Mosso, which registered automatically the muscular resistance. We have thus a basis for the well known refreshing and invigorating effect of the douche,

which in France is so advantageously resorted to by men and women of feeble muscular fibre, by people who lead sedentary lives or lose their vigor in the whirl of fashionable dissipation. To endow the feebly-muscled children and youths with strength, to invigorate the lax fibre of those men and women who either have no time or inclination to indulge in normal exercise in the open air, there is certainly no measure more valuable than the cold douche, carefully adapted to each individual in duration, temperature, and pressure. I do not refer here to diseased conditions, but simply to abnormal feebleness of muscle and the incapacity for normal work.

In all those diseased conditions, however, in which this loss of muscular vigor is the result of feeble digestion, of depreciated nerve tone, or even of organic disease, the douche in its numerous modifications offers a method of restoring vigor which has often surprised me by the rapidity and completeness of the result. For there is no hydriatic procedure that can approach it in improving the general circulation, as well as the tonicity of the smaller vessels and of the tissues. It deepens the respiration, and thus gives rise to the exchange of gases which enhances tissue change. As Pospischl says, "the mechanical massage produced by a good fan douche sets the diseased structures into a vibration which is not to be approached by ordinary manual massage."

It may be used in feeble subjects who are able to stand, because it does not abstract much heat, and may be preceded by the dry pack, or brief hot-air bath, which accumulates upon the surface all the heat to be abstracted, and thus forestalls any actual loss.

In *anæmia* and *chlorosis*, in *hypertrophies* of the liver and spleen, in *neurasthenia* of the depressed type with introspection and melancholic ideas, in *gastric* and *other troubles* requiring a heightening of muscular energy, in all those conditions in which an elevation of nerve tone is demanded, we have in the douche a most powerful weapon for good—and I may say also for evil. Like a two-edged sword, it may inflict damage when carelessly used. It should never be administered without the prescription of a physician, who should designate the duration, temperature, and amount of pressure. I am cognizant of an eminent neurologist having given a patient an order to a bathing establishment as follows: "Give the bearer a douche." He might as well have given him an order to the druggist: "Give the bearer some strychnine." The difference, however, is in favor of the strychnine prescription, because every druggist is educated in the knowledge of the toxic doses of medicines, whilst few bathing establishments have attendants who are educated in the much more intricate dosing of a douche, whose effect is governed not only by the temperature, pressure, and duration, which may be mathematically measured, but by the constitutional

peculiarities of the patient and their modification by the existing disease. This brief review of the mechanism, rationale, and therapeutic indications of the douche offers the principles for its application which would enable the intelligent physician to adapt it to the various diseases in which an improvement of assimilation and haematoses, elevation of depreciated nerve tone, equalization of perverted nerve force, absorption of pathological products, or increase of tissue change is demanded.

CHAPTER IV.

THE SITZ (HIP) BATH.

The sitz bath is a partial submersion of the pelvic portion of the body in water, including the lower portion of the abdomen. The patient retains his upper clothing, or is comfortably clad and covered with blankets, and the feet are placed upon a blanket. After he is seated in a bath containing a sufficient quantity of water to completely cover the hips, the foot blanket is carried over the thighs and tucked around the tub. The latter should have a high back upon which the patient may lean, and its under edge should be rounded and smoothed, so as not to be uncomfortable. Moreover, the feet should be supported so that the popliteal space clears the edge of the tub. The patient's head should be covered with a damp turban to prevent retrostasis.

The exact and interesting experiments made by Drs. Schweinburg and Pollak, under the guidance and at the suggestion of Prof. Winternitz, afford a rational basis for deducing the therapeutic effect of hip-baths. The individual was placed into an empty tub, in order to avoid errors arising from change of posture, and covered with blankets. Dudgeon's sphygmograph was secured to the radial artery in a comfortable position of the arm, the carotid pulse was counted, and the blood-pressure was recorded at the

temporal artery. Now water at the desired temperature was poured into the tub. Thus the observations were made before, during, and after the hip bath. The results were as follows: The hot hip-bath (104° - 113° F.) produced almost without exception slight increase of the pulse rate and occasional considerable reduction of blood-pressure, while the cold bath (50° - $54\frac{1}{2}^{\circ}$) produced a slight diminution of the pulse rate and an occasionally considerable elevation of blood-pressure.

According to Winternitz, the sitz bath is a potent factor in influencing the circulation of that immense vascular area comprised in the intra-abdominal vessels. This system of vessels may be compared to a reservoir of flexible dimensions, whose mission it is to receive temporarily all blood from other parts, to which it is again returned when needed. The capacity for changing their calibre and area renders the intra-abdominal vessels a kind of safety valve for regulating the pressure relations in the entire vascular system, as has been shown.*

Any procedure, therefore, which may powerfully influence these vessels, must be potent for good as well as evil. It has already been mentioned in the first part of this book that the plethysmograph distinctly registers an increase of volume in the upper extremities when an individual is placed into a cold sitz bath. There is a rush of blood to the head, manifested by the usual symptoms. Otherwise the

effect is the same upon the respiration, circulation, tension, etc., as from the impact of cold water upon any other part of the body. There is no other method by which blood may be driven to the upper portion of the body. All the effects of this bath may be traced to a reflex excitation of the sympathetic nerve.

Hip-baths of from 50° to 60° , of from ten to twenty minutes' duration, excite the vaso-motor nerves of the abdominal organs, contracting these vessels, diminishing their calibre and contents, and, as a result, the intestinal secretions and peristaltic movements.

The therapeutic indications based upon the rationale of the action of the hip-bath are readily deduced. In all conditions of the hyperæmia of the intra-abdominal organs in diarrhoea and dysentery, hip-baths may be of great service. Brief dipping of the lower abdomen into cold water, on the contrary, produces hyperæmia of the organs, increasing the tone of the intestines and enhancing their functional activity; while prolonged hot or cold hip-baths (of one or two hours' duration) produce a relaxation of the intra-abdominal vessels and a corresponding effect upon the blood-distribution in neighboring parts. Winternitz insists, and I am able to corroborate this clinical observation, that there is no remedy which is so efficacious in the most obstinate diarrhoea as a cold hip-bath which has been preceded by an energetic wet-sheet rubbing. The latter increases the cutane-

ous vascular area, while the hip-bath of 50°–66° F. excites the sympathetic, contracts the intestinal vessels, and diminishes peristaltic action, if prolonged.

In disease of the urinary and sexual organs, brief cold hip-baths are useful when there is a sluggish circulation or stasis from chronic congestion or inflammation, while in active pathological conditions they are contra-indicated. Hence in impotence, spermatorrhœa, relaxed conditions of the ovaries, the uterus and its ligaments, in amenorrhœa and passive menorrhagia, these baths are indicated, as also in congestion of the brain, lungs, and liver, in gastric and intestinal ailments, constipation, etc. They are especially contra-indicated in all irritable conditions of the urogenital organs, with frequent emissions.

There is no greater and more common error than to suppose that ordinary cold hip-baths are calming or depressing to the pelvic organs. It is certain that a very brief dip of the pelvis into cold water increases the energy and pressure of the portal circulation. The prolonged cold hip-bath, on the contrary, reduces temperature for the time, and may prevent reaction and consequent excitation. These act as tonics, and aid in relieving inflammatory conditions, if they last thirty or sixty minutes and are 56°–64° F. In cystitis, urethritis, uterine haemorrhage, and prostatitis, in diarrhœa, dysenteries, these prolonged hip-baths are exceedingly useful. When a decidedly calming effect is desired, the warm hip-bath of one or two hours'

duration, 90° to 100° F., is a long-established remedy for vesical tenesmus, in menstrual pains, etc.

But the most valuable pelvic antiphlogistic hip-bath is the lukewarm bath, 70° to 80° F., with friction.

The author has found a gradually-cooled hip-bath, beginning at 90° and gradually adding ice-water from a pitcher so as not to touch the body, useful in utero-vaginal difficulties when not connected with pus formations.

The numerous partial baths described in hydro-pathic literature are not here detailed, because the author has had no experience with them, and his reasoning upon the subject leads him to adopt the course of simplifying hydrotherapy by omitting all procedures not capable of a rational therapeutic basis.

CHAPTER V.

AUXILIARY METHODS.

Experience has demonstrated that the therapeutic results of all hydriatic measures are greatly enhanced by certain auxiliary measures, which are either preparatory or are practiced in connection with them. The most conservative practitioners and clinical teachers constantly refer to these. Prof. Semmola tells his classes in the Naples University (page 230 Clinical Therapeutics, translated into German with a preface by Prof. Nothnagel, of Vienna): "In visceral troubles which defy all treatment because they are favored by special alterations in the tissue changes, the physician may accomplish in many cases a true and real cure by endowing all the functions of the organism with the highest activity without the aid of medicinal agents, *i. e.*, solely and purely by the application of *ordinary physiological agents*, and, above all, of hydrotherapy. The methodical internal and external use of water, *together with climate, exercise, etc.*, is the means by which hydrotherapy stimulates cutaneous activity, and with it all functions of tissue change and organic purification, so that often real marvels of recovery are obtained in serious and desperate forms of disease. Unfortunately, these wonderful effects are more rare to-day than they were in the time of Priessnitz, and of which I was a personal

witness. Those who were in a position to follow up the cures of Priessnitz will remember well what marvelous and unexpected recoveries were accomplished at Gräfenberg by means of the water treatment." And Prof. Erb, of Heidelberg, after referring to the effects of baths (*Diseases of Spinal Cord*, in Ziemssen's Cyclopedie) as "extraordinarily favorable in all possible forms of chronic troubles," says: "If we add to these the increase of perspiration by certain procedures, the effect of increased water consumption and muscular movements, the influence of diet, climate, altitude, it is evident that we possess few remedies which exert an equally powerful influence upon the nervous system."

Erb's opinion of medicinal therapeutics is not very high, as is evident from the following comments upon "chemical or internal remedies:" "Here we enter upon a very obscure field which needs thorough cultivation. We know almost nothing of it; the little which therapeutic experience has taught us is neither securely established nor in any way scientifically or intelligibly founded."

These recognized teachers are here cited to illustrate the fact which I desire to impress, viz., that water is not a universally applicable remedy which may be relied upon alone and unaided in the treatment of disease. It is the just boast of the empirics that they have utilized diet, exercise, and regulation of habits as auxiliaries of water. The

educated physician makes no such boast, for he has for centuries studied and practiced these methods, but he has not until recently applied them systematically. An excursion into the field of auxiliaries is tempting, and may not be without interest to the reader. In an essay read before the eighty-sixth meeting of the New York State Medical Society this subject was briefly treated (*The Successful Treatment of Chronic Diseases—A Plea for their More Methodical Treatment*) as follows: “I regard it as of paramount importance to impress upon the patient the need, not only of systematic diet, but of systematic exercise. Unless the physician be convinced of this, he will permit the disinclination of all diabetics to exercise to overcome his injunction. The latter cannot be made too strong. *A certain amount of exercise must be prescribed and taken.* I advise the use of the pedometer for the purpose of measuring and recording the amount of walking exercise, which is by far the best taken by the patient. Why should we not have an exact estimate of so important an item of treatment? The patient’s statement may be a fair guide in some cases, but his physical condition renders him a prejudiced witness, be he ever so honest in his intentions. Whenever we shall dose our exercise as we do our medicines, and see to it that our prescriptions are followed as punctiliously as we are wont to do in medicine, we shall achieve greater precision in our results. In the discussion of the treatment of diabetes, in the New

York Academy of Medicine, on March 18, 1888, I endeavored to emphasize the importance of active and passive exercise *adapted to the requirements of each case*. So convinced was I of the value of this therapeutical measure that I had adopted the method of compensating my diabetic patients for taking the prescribed exercise by a definite allowance of white bread (for which they all crave), graded according to the amount of exercise taken."

Electricity, diet, exercise, climate, etc., are so well treated in many works that no special reference shall be made to these except to insist upon the necessity of their more methodical, simplified, and systematic application. Many chronic diseases would thus be cured which otherwise succumb because of insufficient attention to details by both physician and patient. There is one measure to which attention may be usefully directed at this point, because its object is to increase the reactive capacity of the patient. It thus becomes an important part of hydrotherapy.

THE HOT-AIR BATH.

Administered rationally and with discrimination—not as is done in Turkish baths, but in the form of what the French call *étude sèche*—the hot-air bath presents so many therapeutic advantages that a detailed description is necessary.

The apparatus in use at the Montefiore Home (see illustration) and at the Hydriatic Institute in

New York City consists of three air-boxes, each $2\frac{1}{4}$ ft. wide \times 4 ft. deep, and 3 ft. high. They are shaped as shown in the diagram. The front and upper portions consist of two doors, which open on hinges. The seat being adjustable, the patient is placed high enough to enable him to move his head comfortably above the collar opening. The door being closed, he is surrounded by hot air, derived from a large metal radiating coil connected directly with the boiler, so as to be independent of the ordinary heat supply of the building, and thus be utilizable in summer as well as in winter. Practical experience with this apparatus during the past three years proves it to be absolutely perfect, though very simple. The temperature of the air surrounding the patient is controlled by a valve, and may be easily raised to 180° . This is rarely necessary, however.

The patient's head is enveloped in a wet turban after he is seated; and the collar opening, which is large enough to permit freedom of motion, is covered by a bath towel to prevent escape of heat. The pulse and mouth-temperature are taken and recorded every ten minutes. After the desired rise of temperature and perspiration are obtained, the patient is subjected to a cooling douche from 100° to 50° F., as indicated in each case. The advantage of the hot-air bath over the ordinary Turkish bath is evident. The patient breathes cool, fresh air while his body is subjected to the heating; he is not stifled.

Rationale.—Anton Frey (Volkmann's Sammlung Klin. Vorträge, No. 332) has given us an admirable résumé of the rationale and effects of the hot-air and vapor baths. As has been shown in the first volume, if the body is exposed to temperature changes, the principal effect is an irritation, accompanied by dilatation of the cutaneous capillaries after heat, and their contraction after cold. It has been shown how powerfully these manipulations affect the heart action and blood-pressure, heat production, and tissue change; indeed, all organic functions. That the system protects itself against injurious temperature changes has also been demonstrated, chiefly with regard to external applications of cold. The same principle is applicable in explanation of the rationale of the hot-air bath.

We have here three factors—the thermic irritation, the heat supply and loss, and the protective action of the organism against these. The temperature equilibrium of the human body is due to two constantly active factors, heat production and heat diffusion. These are under control of the nerve-centres, which are connected on the one hand by cerebro-spinal and sympathetic fibres with the tactile nerves of the skin, and on the other with the abundant capillary network of the skin and muscles, both of which respond to the slightest temperature impressions by narrowing or dilating the cutaneous or muscular capillaries. Thus are the production and dif-

fusion of heat regulated. It becomes evident that this responsive action of the nervous system differs in different individuals, and even in the same individual at different times.

In five minutes, usually, the pulse rate begins to increase; five minutes more mark a rise of temperature and an increase of respiratory movements. The average normal case may within half an hour be made to register an increase of thirty to fifty pulse-beats, and of one to three degrees of temperature.

The skin becomes hyperæmic and succulent, and its tactile and electrical sensibility is heightened. Owing to the absence of a muscular coat, the capillaries are really only thin structures, practically elongations of the inner arterial coats, and depend for firmness and elasticity upon the surrounding structures. As the latter are expanded by heat applied to them, it follows that the thread-like capillary must become dilated to many times its calibre, and is thus made to receive more blood.

It has been ascertained by the plethysmograph, which measures the volume of parts exactly, that not only does the body, especially the extremities, increase in circumference, but that the increased pulsation of the heart sends blood with more force to the non-resisting and enlarged capillaries. But that such an enormous diversion of blood to the surface must change the existing conditions of the circulation, disgorge the venous system, the kidneys, liver, and

spleen, may be easily understood. A. Frey has ascertained by the sphygmograph and sphygmanometer that the vicarious emptying of other organs cannot entirely compensate this centrifugal flow, but that there is a loss of pressure in the entire vascular system, a loss of tension of the vessel-walls. The heart requires less labor to send the blood forward, because the peripheral resistance is diminished. On this principle may be explained the faintness, tinnitus aurium, and symptoms of cerebral anaemia which sometimes ensue, and which are more frequent in the Turkish bath, where hot air is inhaled and thus locally applied to the pulmonary capillaries also. So soon as the surface temperature is reduced by the cold bath or douche, the previously anaemic organs become again full of blood. Herein lies danger, if there exist a brittle condition of the vessel-coats or a cardiac lesion.

For this reason it is best in elderly or otherwise feeble persons to lower the temperature gradually, to allow the inner organs to accommodate themselves. If the proper douching and friction have been practiced, the skin will remain sufficiently hyperaemic to present a rosy hue. But this is not a relaxation, it is a tonic condition, which assists the heart in propelling the blood through the vessels. The pulse remains somewhat more frequent, becomes soft, and the blood-pressure is lowered a little. The therapeutic advantages arising from this condition are self-evident. The

respiration is as much affected by the hot-air bath as the circulation.

The thermic irritation of the periphery excites reflexes which accelerate the breathing; besides this, the superheated blood stimulates the vagus also. I have often noted a respiration of 25 per minute, although the inspirations are deep. The cooling process reduces the number of respirations according to its intensity and rapidity, although, like the temperature, they remain more frequent than normal for a time. It is fair to assume that the increased excretion of CO₂ and increased demand for oxygen indicated by the enhanced respiratory processes are manifestations of increased oxidation. The urine affords corroborative evidence on this point, and this evidence is the more valuable since we may obtain it with some degree of precision. The quantity of urine is reduced about one-fourth by the hot-air bath in persons who take constantly the same amount of fluid. This reduction is not as great at the time of the bath as during the four or five days succeeding it. This may fairly be explained by the effort which the organism is called upon to make in order to eliminate the waste products which the bath produces. The specific gravity of the urine increases in proportion to the diminution of the quantity, but this increase continues even after the urinary volume is restored to normal. Thus we have positive evidence of the increased production of the solid urinary prod-

ucts. Urea is clearly excreted more abundantly; about one-third more is eliminated on the day of the bath, and this increased elimination continues in less quantity until the fifth day. If fluid is moderately drank during the bath, the increase of urea is not so great immediately after the bath, but is greater during the five days succeeding it. There is evidently a retention of urea in consequence of insufficient urinary water, but the average of the six days is nearly the same whether the patient drinks water or not, and *affords a positive measure of the increase of tissue change.* The *uric acid* excretion produced is doubled and even trebled; it is greatest in the urine passed after the bath, but diminishes rapidly during the succeeding days. The quantity of sulphuric and phosphoric acid is also decidedly increased during and after the hot-air bath.

An interesting table, constructed by Godlewsky, demonstrates clearly that under the influence of hot-air baths a decided acceleration of oxidation of nitrogenous substances (nutrient and tissue albumin) is inaugurated, which lasts several days. Since, however, it would be impossible to maintain an increased heat supply necessitated by the continued heat diffusion for so long a time, an increased combustion of fat becomes necessary. This is entirely in accord with the daily observation that hot-air baths are competent to produce rapidly a very considerable reduction of fat in persons who have reduced their

consumption of fats and liquids. Experiments upon animals also teach this lesson. Hence we possess in these baths a means of inducing and maintaining a considerable acceleration of oxidation. The body offers for this purpose the necessary nitrogenous and non-nitrogenous materials (Frey).

The quantity of perspiration produced by the hot-air bath differs greatly in different individuals and at different times.

In a recent case, now under observation by myself, a young man of sixteen, student at the Stevens Institute, weighing $188\frac{1}{2}$ lbs., with a girth of 38 inches, lost $3\frac{1}{2}$ lbs. the first bath. The urea, which was before the bath 6 grains to the ounce, increased to 8 grains to the ounce in the urine passed after the bath. After three baths there was a total loss of $3\frac{1}{2}$ lbs. and a decrease of 3 inches in the girth, so that his trousers were perfectly loose. Before the fourth bath he had regained 1 lb. After the fifth bath the urea was $8\frac{1}{2}$ grains to the ounce. These measures were made by my son, H. B. Baruch, and the case was observed by Dr. Max Rosenthal.

The therapeutic results of hot-air baths are summed up correctly by Frey as being the outcome of increase of tissue-metamorphosis due to the elevation of temperature and the elimination of its end products; they change the hæmostatic equilibrium by inducing a more active cutaneous circulation, and increase the elimination of water.

Obesity, chronic rheumatism, gout, and certain cases of anaemia offer indications for valuable therapeutic results from these baths.

In recent myalgias and neuralgias, lumbago and other forms of muscular rheumatism, indeed in all those affections for which the Turkish bath is usually prescribed, the hot-air box as here described (carefully observed and guarded by frequent examination of the patient, followed by douches at temperatures judiciously adapted to each case) must be regarded as far exceeding in value and extent of applicability the empirically used Turkish baths.

Anton Frey has observed valuable results from hot-air baths in cardiac diseases, even in cases in which there was insufficiency of the heart muscles, or valvular disturbance, with consequent loss of compensation. In the latter greater care must be exercised, but we may accomplish a good deal in them, as in all cardiac diseases, by inducing hyperæmia of the skin and consequent removal of peripheral resistance to the blood current and diminution of blood-pressure. Care must be exercised, however, in the cooling process, which must be gradual, with friction to maintain the patulous condition of the cutaneous vessels. My personal observations on the value of these baths were illustrated in a paper before the New York State Medical Society, at the eighty-sixth annual meeting, Feb. 6, 1892.

In *syphilis*, when the system has been saturated

by mercury, whose elimination is desired, we have a valuable eliminant in the hot-air bath. The experiments of Borovsky (British Journal of Dermatology, 1889), showing the comparative value of various baths, prove that, "as a means for freeing the patient's system from mercury, hot-air baths should be preferred to all other baths; hot-air baths at 170° - 180° of twenty minutes are borne better than those at 140° - 160° of thirty minutes, and act better than hot-water baths, which sometimes give rise to faintness; hot-air baths, by inducing intense thirst, increase the ingestion of liquids and then enhance metabolism."

CHAPTER VI.

HYDROTHERAPY IN FEVERS.

The technique of the methods usually resorted to has been fully described, together with the rationale. Fevers offer the most prolific field of hydrotherapeutic success. If we dwell upon them more fully, perhaps, than upon any other subject, the importance arising from the frequency, universality, and fatality of some fevers furnishes ample warrant.

The frequent revival of this subject in our medical societies is evidence, not only of its incalculable importance, but also of the instability of our present therapeutic methods.

Brilliantly and learnedly though we may discuss typhoid fever, favorable though our individual statistics may be, still the figures of our Board of Health reports bid us "mend our ways" in language more eloquent than human tongue or pen can formulate. Twenty-five to forty per cent. is the death rate from typhoid fever in our American cities; twenty-six per cent. is the mortality of the New York hospitals in recent years, according to Dr. Delafield's investigations. The import of these figures cannot be overestimated. May they be changed?

Happily there is a method of treatment which has the sanction of long usage, the authority of judicious clinical observers, and the evidence of unimpeachable

statistics. To further the universal adoption of this method, I propose to devote all the energy of my nature, because I am a proselyte myself. I once said in the Academy of Medicine: "Plunging a typhoid fever patient into a tub of cold water may suit a German soldier, but it is not adapted to our American constitutions." I have lived to regret these words of derision, and, repenting thereof, I warn my colleagues against this prevalent error.

I have recently revised my experience, with the result of reaching some decided views, which differ radically from those generally entertained by the profession in this country, and, up to a recent period, by myself also. These views are the result of mature deliberation and sifting of evidence afforded by clinical and experimental data, obtained from various sources and compared with my own.

I need not dwell upon the various methods of treatment advocated during the past thirty years of my professional career. About ten years ago I had settled upon the Ziemssen graduated cold-bath treatment as the most promising, and I obtained more satisfactory results from it than from any other. Still, when other antipyretic methods came into vogue, with so much promise of success, based upon the idea that the reduction of high temperature was the chief desideratum, it was natural for me to be carried away upon the tide which so completely swept over the profession, especially as the treatment by cold baths

involved so much trouble, and proved so disagreeable to many patients and their friends. Gradually the milder form of bathing, by wet-pack and sponging, with quinine, thallin, kairin, antipyrin, the ice-coil, and, later, antifebrin and phenacetin, have assumed potent sway over the profession. A review of experience in the last *decennium*, derived from personal observation in private and hospital practice and from that of many colleagues, as well as from society discussions, develops the fact that *the mortality of typhoid fever has not been reduced by the antipyretic method of treatment.* A fair, conscientious, and exhaustive review of the results of the various methods in vogue during the past twenty-five years will demonstrate that we stand to-day upon the threshold of a great epoch in the treatment of typhoid fever.

How fatal typhoid fever is at the present time may be gathered from the statistics quoted above. This mortality is even larger than that furnished by the recently gathered, careful statistics in Germany, which show that under the expectant treatment of 11,124 cases the mortality amounted to 21.7 per cent. Dr. Murchison has compiled 27,051 cases, in which the mortality per cent. was 17.45.

Jaccond has collected 80,140 cases on the Continent, with a mortality of 19.23 per cent. The English army statistics averaged, for the six years ending with 1877, 32 per cent. mortality; in the navy it was 25.5 per cent.

These statistics, to which others may readily be added, were they not sufficiently large, present to us the appalling fatality of typhoid fever under the expectant, antipyretic plan, which seeks, by nourishing the patient, placing him in good hygienic surroundings, combating complications, and reducing the temperature, to conduct him to a safe issue. Much stress has been placed during the past quarter of a century upon high temperature as the predominating element of danger in typhoid fever. It has been claimed that parenchymatous degeneration of the heart, kidneys, and other organs was the direct result of prolonged high temperature, and the chief energy of therapeusis was expended upon this hydra-headed monster. This idea was indeed sustained by, if it did not originate in, the marvelous success of the cold-water treatment, which Brand, of Stettin, in 1861, brought before the profession in Germany, and which was adopted, after some modifications, by Liebermeister, the high-priest at the altar of antipyresis, as well as by Jürgensen, Ziemssen, and others.

The history of this special subject is indeed instructive, inasmuch as it illustrates how surely bedside experience will, sooner or later, demolish the most stately structures erected by theoretical reasoning. Brand never claimed that this bath treatment was chiefly directed against the high temperature. On the contrary, this was a secondary object with him. Liebermeister's criticism (*Handbook of General*

Therapeutics, William Wood & Co., 1885) is at once the best exposition and the highest encomium of Brand's method. On page 15 he says: "The work of Brand, which was published in 1861, ranks high above the level of the publications of the professional hydropathists of to-day. Still, the author occupies pretty much the ground of Priessnitz. The preëminent importance of abstraction of heat is not sufficiently recognized; the main action of water is more than that of stimulation," etc.

Now, I propose to show that the standpoint of Brand is correct to-day, and that it is sustained by the most incontrovertible evidence of experimental study, seconded by clinical experience gathered from carefully recorded data. Thinking men are beginning to ask themselves the question: Has the introduction of these powerful antipyretics reduced the mortality of typhoid fever? Three years ago I answered this question in the New York Academy of Medicine affirmatively, but I stated my belief that the small improvement was attributable to the comfort afforded the patient more than to the removal of danger from high temperature. To-day, after an exhaustive review of the whole subject, I am prepared to agree with Brand, that the only advantage from antipyretic medication seems to be that the *patient is able to die with a nearly normal temperature*. The fact that the statistics of private and hospital practice show a mortality reaching beyond 24 per cent. since

the introduction and abundant use of antipyrin and its substitutes, proves their inadequacy. And the fact becomes more glaring when statistics of the cold-water treatment reveal the astounding reduction of mortality to 3.9 per cent.

We have reached a point in the study of this subject, so fraught with deepest interest, where it is our solemn duty to pause, weigh the reasons of this enormous difference in the mortality, and ascertain if it may not be reduced. I propose to establish the fact that this mortality may be reduced, as Brand has reduced it, to *one per cent.*! Those who, like myself, have personally witnessed the fatality of typhoid fever in New York City, may, as I once did, shrug their shoulders in doubt. But a brief analysis of the reasons for the superiority of the bath treatment will demonstrate that this is not a chimera, but a substantial fact, based upon the most reliable clinical data.

Brand offers the statistics of 19,017 carefully gathered cases of typhoid fever (*Deutsche Med. Wochenschr.*, 1887), which demonstrate that under the general influence of all kinds of cold-bath treatment, without, however, its strict enforcement, the mortality has been reduced from 21.8 per cent. to 7.8 per cent. But this is not all. He has obtained from twenty-three German and French distinctly designated sources the reports of 5,573 cases (to which I have added more recent reports)—statistical evidence which has not yet been, and cannot be, controverted, and by

which it is clearly shown that the cold-bath treatment originally recommended by him has reduced the mortality to 3.9 per cent. The latter, however, still contains many imperfectly managed cases. Eliminating these, the number treated strictly by Jürgensen, Vogl, Brand, and others up to January, 1887, amounted to 1,223 cases, of which 12 died—a mortality of one per cent. And yet this is not all, for the most significant fact deducible from these statistics is that *not one of the twelve deaths occurred in any case that came under treatment before the fifth day.* Brand boldly asserts, on the strength of these 1,223 cases, of which he treated one-fourth in private practice, the remainder coming from Jürgensen's hospital at Tübingen, Vogl's at Munich, and the military hospitals at Straslund and Stettin, that all cases of typhoid fever coming under treatment before the fifth day should recover. Medical statistics are proverbially unreliable, but the exactness of the figures presented by Brand in his able polemic in the Deutsche Med. Wochenschrift for 1887 cannot be doubted, nor the deductions gainsaid, because they are furnished from civil and military life, from university clinics and military hospitals, in which the cases were observed by competent and well-trained men, and they have been confirmed by more recent reports, as I shall show.

Valuable as these statistics must be as an argument in favor of strict cold bathing, the results of the latter are better illustrated by some comparative sta-

tistics made by several clinical observers. For instance, the official records of the Second Prussian Army Corps, quoted by Brand, show that while, from 1849 to 1866, the mortality among 1,970 cases was 26.3 per cent., it was reduced, among 2,714 cases of strict cold-bath treatment, to 4.3 per cent. This enormous reduction is the more glaring when this mortality of 4.3 per cent. is compared to that of other armies. In the French army it was 32.2 per cent., in the Italian 28.6 per cent., in the Austrian 27.4 per cent., and in the English 23.8 per cent., during the same period. Indeed, so striking was the reduction of mortality wrought by this treatment in the German military hospitals, that the Prussian War Department deemed it incumbent upon itself to issue, on Jan. 25, 1883, a circular to the medical service, in which it was urged that, "inasmuch as the Brand treatment has been instrumental in reducing the mortality of typhoid fever in the various hospitals from 25 per cent. to 8 per cent., we are justified in expecting that, with an increased perfection and more general adoption of this treatment, it may become possible to save a still larger number of sick men."

As doubt has often been cast upon the correctness of these statistical statements and their applicability to our own country, the following opinions from reliable sources may be of interest.

Dr. J. C. Wilson, of Philadelphia, now Professor of Practice in Jefferson College, wrote me on Oct. 16,

1890: "I confess to having entertained misgivings as to the accuracy of Brand's statements for a long time; but during the last two or three years communications from other sources, particularly those from the French army medical men at Lyons, Nancy, and elsewhere, as well as the confirmation from German sources, aroused a deep interest on my part; and I took occasion last spring to investigate the matter systematically for myself. *No one who has done this, following the method closely, and avoiding medication, can doubt the efficacy of the treatment.* In this community it would be at present impracticable to introduce the treatment to any great extent in private practice; but the publication of statistics which are incontrovertible, and which prove that the average mortality can be reduced from its present figures, perhaps 16 per cent., including hospital and private practice, to 2 or 3 per cent., will in a short time render the employment of baths practicable both in public and private practice. I find the trouble lies chiefly with our physicians, some of whom are closely hidebound and subject to traditions. But there are many others who are open to conviction."

In an able essay, read before the Lyoming Medical Society, and published in the Medical News, Dec. 6, 1890, Dr. Wilson goes carefully over the methods now in vogue, and endeavors to prove that the very multitude of plans and remedies shows a continued unrest and dissatisfaction with existing methods of

treatment, and "when we come to apply the test of efficiency in their influence upon this death rate, dissatisfaction with existing methods finds ample warrant." He furnishes his own experience in clear language, showing that the statements made by European observers were fully realized in his series of cases. He says: "Severe symptoms were mitigated, and mild cases ran a most favorable course. As a rule, patients did not object to the baths. When they did so, their objections ceased after a few baths had been administered. Complications were trifling, there were no sequelæ, and in every case the convalescence was rapid and satisfactory."

In a lecture published in Lippincott's International Clinics, for July, 1891, p. 19, Dr. Wilson says: "This treatment has consisted almost exclusively of a routine procedure, and in that respect is wholly at variance with the general teachings of this country in regard to the management, not only of this disease, but of the other acute infectious febrile diseases. It is, moreover, a treatment radically different from any method hitherto practiced in the other hospitals to which you have access, and is only briefly discussed in your text-books. It has now been systematically and continuously carried out in this hospital during a period of sixteen months, and our studies in regard to it embrace, so far as I am informed, a longer period of time and a larger number of cases than in any other American hospital. These cases, in comparison

with the collection of cases studied in England and by English physicians in Australia, and particularly by the German and French military physicians, constitute a very limited experience. But they are, collectively, sufficiently large to warrant a review of our work at this time, especially as our results coincide with those which have been placed on record upon a much larger scale abroad.

“The method of Brand (p. 24), treated with indifference outside of Germany, where it originated, for a long time met with violent and systematic opposition in the country of its birth. By degrees it won its way to favor, step by step, in spite of this opposition. It is now the routine treatment in the German army and in many of the French garrisons; it is much used in hospital practice in England and in Australia, and has within recent years excited widespread attention in the United States. The general testimony in regard to its effect upon the cause of the disease is in entire accord with the statement of Brand.” Dr. Wilson furnishes statistics which offer abundant testimony.

“From Feb. 1 to July 15, 1890, under my service, *forty* cases, no deaths; average number of days in the hospital, 36.9. July 15, 1890, to Feb. 1, 1891, service of Drs. Trau and Wolff, 54 cases, one (?) death from chronic nephritis, three weeks after temperature had fallen to normal; average number of days in the hospital, 38.2. Feb. 1 to June 1, 1891, under my service, 66 cases, 7 deaths; average number of days in

the hospital of the non-fatal cases, 26. Total cases in sixteen months, 160; total deaths, 8 (= 5 per cent.). In the entire series of cases relapses occurred eleven times, multiple relapses once. The average number of baths in each of the first series was 42—the smallest, 10; the largest, 180. Among the deaths the average date of admission was the eleventh day. A proper analysis of these cases would show that from Feb. 1, 1890, to February, 1891, there were 94 cases treated in the German Hospital of Philadelphia, without a death, while in other hospitals in the same city the mortality in 271 cases during the same period, under expectant and mild water treatment, was 13.29 per cent.

"Dr. G. C. Smythe, of Indianapolis, Ind., reports, Sept. 15, 1883, to the Medical Society of the Mississippi Valley, 157 cases of typhoid fever treated by baths by himself and three colleagues, with 3 deaths (1.9 per cent.). He says in a later paper (*Transactions Indiana Medical Society*, 1889, p. 8): 'No one has a right to oppose this treatment upon purely theoretical grounds. He who does so, and refuses to adopt it, signs the death warrant of twenty individuals out of every hundred with this disease, and a discriminating public will hold him responsible.'"

Dr. Carl Borning, in a paper read before the Detroit Medical Association, and published in the *Physician and Surgeon*, December, 1889, says on page 2: "In reviewing 61 cases"—which he had treated with-

out a death by Brand's method, with no medicine except one or two large initial doses of calomel—"I have to say most emphatically and decidedly that Dr. Brand's method of treating, with cold baths, typhoid fever or typhus fever, or in fact all diseases with a continuous abnormally high temperature, is the very best, the ideal mode of treatment, and the one which should be pursued in every case, may it be severe or mild, and, *if this plan is persisted in from the beginning, no anxiety need ever be felt by the physician about his patient, for he will surely recover.* The course of the disease will be relatively mild, and all those various and dreadful complications which are so common with any other plan of treatment will be almost entirely excluded. But, in order to get these results, you have to carry out Brand's directions to the letter."

A work on the Hydriatic Treatment of Typhoid Fever has recently been published, which does great credit to the head and heart of its author, Dr. Carl Sihler, of Cleveland, Ohio. This gentleman was so firmly convinced of the life-saving value of the Brand method in typhus fever that he undertook, at his own expense, the work of translating Brand's, Vogl's, and Tripier's contributions (from which I have in this monograph so liberally quoted), because "here was a chance for missionary work in a field which promised many good results." The author justly says that, while his personal experience "covers the first period of experience with the water treatment, when serving

my apprenticeship, and shortcomings and mistakes in the application of the method would be apt to make such observations of little value," it demonstrates clearly "with what degree of accuracy and how extensively an ordinary practitioner in private practice is able to follow" this method, even among the laboring classes. During two years Dr. Sihler treated 54 cases of typhoid fever with water, with three deaths, and 26 mild cases, some of which had baths, with but one death;" and concludes by saying "with this method a powerful means for good is placed in the hands of the physician, and I would no more think of placing any one dear to me personally, suffering from typhoid fever, into the hands of a physician who does not act according to the principles of Brand, than one who had to undergo an operation into the hands of a surgeon who does not act according to the principles of Lister."

Dr. Hare (Practitioner, March, 1891) reports 1,828 cases for the Brisbane Hospital, Queensland, treated by the expectant method, with a mortality of 14.82 per cent., while of 1,173 cases treated by cold bathing the mortality was 7.84 per cent. As quinine and antifebrin were also used when the temperature was obstinate to the baths, we must place these statistics among the mixed bath treatment. Dr. Hare's statistics present almost exactly the same result as that in the second division of Vogl's hospital, in which the same mixed treatment was pursued. They are

equally valuable, because all sources of error are eliminated in this judicious report.

Bouveret records (Lyon Méd., 1891) 100 cases of typhoid fever treated by the strict cold bath, with a mortality of 3 per cent. The average date of admission of the fatal cases was the sixteenth day. He commences in advanced cases at 79° and 80° F., reducing the temperature of the baths to Brand's standard of 65° , if fever does not yield. *He has never had syncope or heart failure from the bath, because he never omits friction over the body, except over the abdomen.* He treats strictly in accordance with Brand's rules, except that the abdominal wet compresses are kept cold by ice-bladders, contained within them.

The following table, which I have gathered with care to exclude all unreliable statistics, presents at a glance the comparative merits of the various methods of treatment. The figures astounded me when I sought them out, and I trust they will impress the lesson they teach indelibly upon the mind of the reader. But I do not ask the acceptance of this statistical evidence alone, although it will doubtless be conceded that never in the history of medicine have statistics of such magnitude, from such reliable and diversified sources, been brought to bear upon a question of therapeutics. The profession should divest itself of the empirical influence of mere figures, which, it has been said, may be marshaled in any cause to prove anything, and *study the reason why the cold-bath treatment of typhoid fever is superior to the antipyretic, expectant plan.*

TABLE OF COMPARATIVE MORTALITY UNDER VARIOUS METHODS
OF TREATMENT IN TYPHOID FEVER.

REPORTER.	SOURCE.	TREATMENT.	NUMBER OF CASES.	% OF MOR- TALITY.
Jaccond.....	Various sources.	Expectant.	80,140	10.25
Murchison.....	" "	"	27,051	17.45
Brand.....	" "	"	11,124	21.7
Detafield.....	New York Hospitals, 1878-83.	"	1,305	24.66
Tripler.....	Lyons Hospital, 1866-77	"	229	26.2
Vogl.....	Munich Military Hosp., 1841-78.	All kinds, chiefly ex- pectant.	5,484	20.7
Hare.....	Brisbane Hospital, 1882- 86.	Expectant, quinine and cold wet sheet.	1,828	14.82
Wilson.....	German Hospital, Phila	Expectant and some baths	271	13.29
Tripler.....	Lyons Hospital, 1873-81.	Expectant and bathing.	629	16.5
Bouveret and Teissier.....	" " 1882-87.	Strict baths in severe cases.	876	6.9
Vogl.....	Munich Military Hosp., 1869-81.	Expectant and baths.	2,841	12.2
Brand.....	Various sources.	All kinds of cold baths.	19,017	7.8
Riess.....	Berlin Hospital.	Permanent tepid baths.	1,000	8.5
Ziemssen.....	Tübingen Clinic.	Graduated baths and antipyretics.	2,000	9.6
Vogl.....	Munich Military Hosp., 1877-87.	Strict cold baths and antipyretics.	702	7.6
Hare.....	Brisbane Hospital, 1875- 81.	Cold baths and some antipyretics.	1,173	7.84
Naunyn.....	Koenigsburg Clinic.	Strict cold baths.	145	6.9
Vogl.....	Munich Military Hosp., (2d division), 1882-87.	More strict baths and less antipyretics.	144	4.1
Vogl.....	Munich Military Hosp., (1st division), 1880.	Strict cold baths.	428	2.7
Vogl.....	Munich Military Hosp., 1882-87.	" " "	141	3.5
Bouveret.....	Lyons Red Cross Hosp., 1891	" " "	100	3.
Brand.....	Various sources.	" " "	2,198	1.7
Brand.....	Same cases, omitting those not treated be- fore fifth day.	" " "	2,150	0.0
Wilson.....	German Hospital, Phila.	" " "	40	0.0
Trau and Wolff.	" "	" " "	54	0.0

In the first place, the idea that high temperature is the chief determining cause of fatality in typhoid fever must now be abandoned. The sooner we cut loose from this bugbear, the better for suffering humanity. Rather than enter upon an elaborate discussion of the present status of the question, I refer to the clear and sagacious review of the pathology of fever by Professor Welch, of Johns Hopkins University, in his Cartwright Lectures, 1888. He gives a cautious, painstaking weighing of all the evidence bearing upon the lethal influence of heat elevation in fever, sustained by experimental and clinical data that must be convincing to any unbiased mind. He says, in summing up (*Medical Record*, April 28, 1888):

“We find that animals may be kept at high febrile temperature for at least three weeks without manifesting any serious symptoms. The only functional disturbances which could be attributed directly to the influence of the elevated temperature were increased frequency of the respiration and quickened pulse. No definite relation could be established between the variations of arterial tension which occur in fever, and the height of the temperature. Although the experiments narrated showed that prolonged high temperature is an element in the causation of fatty degeneration of the heart, they also indicated that other factors, such as infection, are concerned in the production of the lesion. Moreover, experimental evidence was found in support of clinical facts, showing

that this alteration may exist without serious interference with the functions of the heart, so that the conclusion seems justifiable that *failure of the heart-power in fever is less an effect of high temperature than of other concomitant conditions.* The lessened perspiration, the renal disorders, and the digestive disturbances (with the possible exception of constipation) are referable also chiefly to other causes than the increased temperature. Both experimental and clinical observations strongly support the view, now widely accepted, that the disturbances of the sensorium, which constitute so prominent a part of the group of so-called typhoid symptoms, are dependent in a far higher degree upon infection or intoxication than upon the heightened temperature. Although no attempt was made to analyze in detail the clinical evidence relating to the effects of high temperature, attention was called to the fact that the absence of all serious symptoms in many cases of relapsing fever, and in the so-called aseptic fever, in spite of prolonged high temperature, strongly support the conclusions derived from the experimental study of the effects of heat upon man and animals. Even in fever, such as typhoid fever and pneumonia, where the height of the temperature is undoubtedly a most important index of the severity of the disease, there exists no such parallelism between the temperature and the nature and severity of the symptoms as we would expect if these symptoms were caused by the increased heat of the body."

In the discussion of a paper on Antipyretics which I had the honor to read before the Section on Practice of the New York Academy of Medicine, the lamented Dr. Wesley Carpenter said: "With regard to heart failure and degeneration of the muscular fibres of the heart, I had an opportunity, in connection with the pathological department of Bellevue Hospital, to examine microscopically the cardiac muscle in a sufficient number of cases to make it quite evident that it did not occur with the frequency one might be led to expect from reading the writings of the German observers."

Dr. A. L. Loomis said on the same occasion: "I am not certain, for I have been in the line of observations similar to Dr. Carpenter, that failure of the heart is due to parenchymatous degeneration, of which we have at times heard so much, and it has seemed to me to be due to failure in nervous supply as much as to muscular changes."

This is clear evidence from pathologists and clinicians, which I might corroborate by other native and foreign testimony.

Since it may be now regarded as an established fact that high temperature, minus infection, does not produce those serious degenerations formerly ascribed to it, we must seek in the infective process, and the ptomaine-intoxication resulting from it, these deleterious effects upon the vital organs which undermine the system and eventually cause death in typhoid fever.

The cold-bath treatment yields the most triumph-

ant results in combating these very effects of the infective and toxic agencies, with whose true entity we have not yet been brought face to face. It has been clearly demonstrated by numerous trustworthy observers that the reflex stimulus aroused by the shock to the extensive peripheral nerve-endings so energizes the nerve centres which furnish innervation for circulation, respiration, digestion, tissue-formation, and excretion, that the system is enabled to tide over the dangers which would ensue from failure of these functions. This, in a nut-shell, is the effect of cold bathing; the simple cooling effect on the blood occupies a secondary, though not unimportant, office. In the "Rationale of the Tub Bath" (p. 43) the explanation of these effects has been fully given.

The fact, as shown by Winternitz, Quinquand, and others, is that cold baths actually increase oxidation in health, and that while the skin is cooled and the blood-vessels contracted, the deeper structures are slightly increased in temperature and their vessels dilated. As the opposite condition, viz., dilatation of the arteries and superficial vessels, evidenced by the dicrotic pulse and loss of elasticity and contraction of the vessels, with diminution of the blood-pressure in the inner structures, are manifestations of the fever, the effect of the cold bath appears primarily to be directed against these manifestations, as has been demonstrated by Winternitz's sphygmographic investigations.

The vivifying effect upon the nerve centres referred to produces a vigorous cardiac action, which is evinced by the slower and more regular pulse and an improved tension of the vessels; it improves the appetite and digestion, enabling us to enforce a more perfect nutrition; it deepens and lowers the respiration, preventing stasis of bronchial secretions and obviating pulmonary complications; all the secretions are enhanced; the patient is refreshed and invigorated, and fights the battle of life with all chances in his favor. How different is the aspect of the case under the expectant treatment, and how different is the effect of pure antipyretic medication! The temperature may, indeed, be reduced, but the stimulating effect upon the nerve centres and secretion, except on the perspiration, is absent. Vinay (Lyon Médical, 1888), who has made some creditable investigations on the subject, tells us that antipyrin does not relieve the delirium—which is in accordance with my own observation; it does not, like the cold bath, increase the flow of urine, by which noxious elements are eliminated. Vinay has confirmed Vogl's observation that there was a rapid gain of weight after cold baths had reduced the fever. Kairin, resorcin, and antipyrin (according to Jacobowitch, Jahrb. für. Kinderheilkunde, 1885, and other authorities) diminish the excretion of urea and nitrogen; hence they diminish the excretion of the *materies morbi* through the kidneys, while baths increase it. The liver in patients

dying after treatment by antipyrin is from 6 to 12.50 grammes heavier than in those dying after cold baths. This is confirmed by Dr. Porter (New York Medical Journal, July 30, 1887), who found that antipyretics produced granular and fatty metamorphosis of the liver and kidneys. Indeed, there is an entire absence of good effect upon the circulation after antipyrin, an effect which is marked after the cold bath.

In the discussion of this subject, at the instance of Dujardin-Beaumetz, by the Paris Congress of Therapeutics a few years ago, Lépine stated that his investigations showed conclusively that all antipyretics, whose effect is so palpably soothing to the nervous system, act by inhibiting the activity of the protoplasm; they destroy chiefly the red corpuscles, either by converting the hæmoglobin or by attacking the cell-structure itself; they act as poison to the protoplasm. Desplats, though favoring medicinal antipyretics in fevers of short duration, favored most decidedly the strict cold bathing of Brand in continued fevers with a tendency to adynamia or ataxia. Stokvis and Semmola spoke of medicinal antipyretics as dangerous remedies. Semmola thought that whatever comfort was induced by them was purchased at the expense of weakening the patient.

Dr. Horatio C. Wood, who, as Professor of Therapeutics in the University of Pennsylvania and author of the most able work on that subject written in this country, may be regarded as a safe counselor, says

with reference to Brand's method: "I have no doubt that very many persons have died in the United States of typhoid fever whose lives would have been saved if the American medical profession had risen above the opposition of the laity and above its own prejudices."

Another teacher, Dr. H. A. Hare, Professor of Therapeutics in Jefferson Medical College, in his exhaustive Boylston prize essay on "Fever: its Pathology, and Treatment by Antipyretics," furnishes a judicious exposition of this subject. On page 62 he says: "The writer feels sure that antipyrin should be given in typhoid and other low fevers of a continued type only when the cold pack [with which he evidently includes bathing] cannot be used, or, at the end of the cold application, to prevent the temperature from bounding upward after its depression. Further than this, the fever will sometimes resist all doses of antipyrin that we can give, or, at any rate, all that it is safe to give. No fever can resist the cold bath." Also: "Cold bathing is a power for good, before which every other measure must stand aside."

Briefly stated, cold baths are antifebrile remedies, while antipyretics are simply anti-thermic agents. Hence the superiority of the former over treatment by antipyretic medication. A mixed treatment is advocated by Liebermeister and Ziemssen. The latter, who is one of the staunchest defenders of

the cold bath (not, however, as an antipyretic alone), regards the gradually lowered both as better adapted to the exigencies of private and civil practice, while he concedes that the results of Vogl and others, in military practice, leave nothing to be desired. Liebermeister has until very recently insisted upon the cold bath as an antipyretic to produce remissions, and orders quinine to render these more enduring. Naunyn, on the other hand, uses a modified and more temperate bathing, rejecting all antipyretic medication.

As corroborative and explanatory of the reasons of the superiority of the bath treatment, a valuable lesson is inculcated by the reports of Dr. A. Vogl, who is the chief of the Garrison Hospital at Munich. He has collected from the records of that hospital all the cases of typhoid fever treated in it for forty-seven years, giving details of treatment, autopsy findings, and other valuable data in 8,325 cases. The gross results are noted in the table given above. But the most important deduction may be drawn from the fact that since 1875 two methods of treatment were pursued at the different stations of this hospital. In Station I the combined method, consisting of baths of temperature of the room, with 3 to 4 grammes quinine daily, and salicylate of soda, was practiced; in Station II the methodical Brand bath of 60° to 65° F., for fifteen minutes, whenever the temperature reached 103° F., no medicine being used. The barracks in which

this treatment was executed are so well ventilated, as I observed from personal inspection, that their temperature in winter averages about 45°. The long room is heated by iron stoves, is open near the roof, and is so well supplied with windows that it resembles a florist's hot-house. Two tubs, of ordinary zinc, stand at its upper end, under the faucet, and to these the patients are carried. Such management seems heroic indeed, but the results are astounding:

RESULTS.

COMBINED TREATMENT. STRICT BATHS.

Number of cases.....	667	221
Mortality.....	7.6 per cent.	2.7 per cent.
Average stay in hospital..	40.7 days.	47.3 days.
Average duration of fever.	1.9 week.	1.8 week.
Percentage of complications.....	102.0	65.2
Average number of diarrhoeas per day and person.....	1.9	0.7

The report of Vogl is altogether a most remarkable therapeutic statement, because it offers unimpeachable testimony to the effect upon the same type of patients (soldiers of about the same average age and condition of previous health) under depleting, nihilistic, expectant, and water treatment, and also striking evidence on the difference between a combined water and medicinal (antipyretic) method and the systematic Brand (antifebrile) method. The

numbers are sufficiently large to entitle them to respect, and the long period of time during which these observations have been made by various independently acting medical officers must exclude all possible errors resulting either from personal bias or variations in the type of the disease.

Vogl has also confirmed the important fact, first brought out prominently by Brand, that the capacity for enjoying and digesting semi-solid food is greatly enhanced by the cold-bath treatment. Drs. Geo. Peabody and Austin Flint have made the same observation at Bellevue Hospital. The former even allows solid food in the third week of the fever, and the latter has informed me that the appetites of his patients are difficult to appease since using the bath treatment. How different the condition of the stomach is under the expectant or antipyretic treatment, every experienced physician knows but too well. As Brand graphically says, and I can confirm from personal observation: "While, under the water treatment, the tongue is moist, pale, without fur, the pharynx free from pain, the stomach and intestines free from catarrh, the latter only showing swollen glands, we find under other treatment the tongue hard, brown and dry, saliva is absent, swallowing is painful, stomach and bowels utterly incapable of digesting, their mucous lining covered with ulcers, the bowels distended; and in this condition the school demands that the patient be well nourished. What a

singular demand! The digestive organs are in so nearly a normal state under the bath treatment that I often asked myself the question if it might not be safe to give more solid food, in order to appease the hunger. I find in Virchow's Archiv, '89, pp. 95 and 303, an essay by Hösslin, who demonstrates that even in fever and diarrhoea, so long as these do not reach a very high temperature, as is usual in typhoid fever, the nutriment is almost completely taken up; that there is, therefore, no reason to give fever patients less food because it is not digested and absorbed. He regards it necessary to offer typhoid patients the largest possible quantity of concentrated food, as milk, meat, eggs, flour preparations, etc., all, however, in minced and liquefied form."

Tripier and Bouveret give bouillon, extract of beef, coffee and tea with milk, $\frac{1}{2}$ pint after each bath. During the time of relative apyrexia will allow rolls, rice cream, tapioca, chocolate, four soft eggs daily, etc. As soon as the temperature is nearly normal, they allow roast chicken, bread and milk, lean meat, rice, baked brains, white lean meat, a little boiled beef, ground fine, etc. Vogl gives, from the first day, coffee, meat broth with a little flour and eggs, milk, one bottle red wine daily; later, bouillon and eggs, so that patients receive daily 50 grammes albumen, 45 grammes fat, and 200 grammes carbohydrates, a food quantum that could not be permitted to patients who are not bathed. Brand says the most

important element of nutrition, besides the food, is a good stomach, and that this may be obtained by the systematic bath treatment. The bedside observations of the strict bath advocates are so rich in demonstrations of its beneficial effect upon all the functions which contribute to the maintenance of strength and endurance during fever, that I would fain cite them, did space permit.

I have endeavored to show as briefly as possible the reasons the results are more favorable under the cold-bath treatment first suggested by Brand in 1861. The latter is thus demonstrated to be the ideal treatment for typhoid fever, and that whenever a deviation is made from it, Jürgensen's opinion, given at the Congress in London, is sustained, that "whenever he has attempted to deviate from the rigorous cold-water treatment, he was compelled to return to it in order to obtain the best results."

In the fourth Congress of Internal Medicine (1885), eminent clinicians expressed almost unanimously the opinion that "until we obtain a specific curative agent for typhoid fever, such therapeusis is to be preferred which is capable of diminishing or removing the effects of the morbid agents, and that this aim is most surely fulfilled by hydrotherapy; that medicinal antipyretics act only against temperature elevation, but do not, like the bath, produce a modifying effect upon the fever process." Fiehlene, Liebermeister, Jacksch, Strümpell, Rossbach, Heubner,

Jürgensen, Bamberger, were among the speakers on the occasion, and were instrumental in producing a reaction in favor of the bath, which was about to be swept away in the antagonism which antipyretic medicines in typhoid fever had justly evoked.

There is a statistical bureau in Berlin which sifts carefully all statistics pertaining to medicine. In 1887 Guttmann, who is its censor, said in a lecture before the Verein für innere Medicin in Berlin: "An important factor in the diminution of mortality is the more successful treatment now used, *especially* BRAND'S METHOD."

Ziemssen and Vogl furnish from personal experience a description of the beneficial effect of cold baths upon themselves when they had suffered from typhoid fever. They both testified that they should not be deterred by the protests of the patient from rigorously executing the plan of three-hourly bathing so long as the temperature is 103° in the rectum, or when the sensorium is deeply depressed with a lower temperature. Even sleep should not prevent resort to the thermometer and bath, if temperature and pulse urgently demand it.

The object of this treatment, it must be understood, is not to subdue the temperature, but to vivify and energize the vital organs, and thus insure a vigorous resistance to the toxic influences arising from the infective processes. This is the great aim to be kept steadily before us.

In presenting this apparently heroic treatment to the reconsideration of the profession, I am aware that there are serious objections to its general adoption, which seem almost insurmountable. The profession must be educated to abandon the policy of expectancy, whose aim it is to allow the fever to pursue its own course. The annoyance involved in the bath is not in accordance with the expectant plan, whose object it is to avoid all disturbance of the patient for remedial purposes. So long as we had only an inefficient, if not injurious, medicinal treatment, it was wise to avoid disturbing sleep. But in a severe case of typhoid fever it is as important to disturb sleep, if due to stupor, or when the rise of temperature indicates the necessity, as it is in opium poisoning when stupor supervenes. Indeed, the treatment is somewhat analogous, inasmuch as the object is to arouse the nerve-centres and keep them aroused (though not continuously, as in the latter) until the toxæmia has passed away.

The nurses and friends of the patients will be reluctant to adopt so active a measure. If the physician is convinced that he is right, he must insist upon his directions being followed. The idea that the reduction of temperature is the leading object of the cold bath, and the much greater facility of accomplishing this object by antipyrin and antifebrin, may deter many from adopting the former. The fallacy of this course has been demonstrated. Timid per-

sons may be alarmed by the patient's pallor, small pulse, and complaints of chilliness while in the cold bath. But if properly administered, with chafing of the body and limbs, these effects will be counteracted to some extent. Reaction after removal will soon reassure the attendant, and embolden him to order regular repetition.

A slovenly application of the bath, or the substitution of some other method—packing, sponging, sprinkling, etc.—will fail and cause discouragement; it must be remembered this is not cold bathing. A small experience, personal or from hearsay, which may have been unfavorable in one, two, or several cases, will deter some from adopting the energetic cold bathing. The only modification of the general cold bath admissible is the stimulatiug affusion advised by Brand in cases threatening heart-failure and delirium. This is a warm half-bath, with cold affusions over the head, chest, and back. (One important point is that the tub always be brought to the bedside, to avoid unnecessary disturbance of the patient.)

The experience with cold bathing in England and America, where it has never found favor, has been too small to afford a proper estimate of its value. Dr. Bristowe, of St. Thomas' Hospital, may be cited as an example. He says: " My personal experience in this treatment is not extensive, and for some years I have rarely, if ever, resorted to it. I have undoubtedly seen patients apparently benefited

and making a good recovery, but I have never felt satisfied that the benefit was real."

Dr. Austin Flint published, in 1882, a lecture which exercised a potent influence in this country. He treated seventeen cases in Bellevue Hospital. "In a few cases the cold bath of 80° F., gradually reduced to 65°, was employed, but was discontinued on account of inconvenience." His conclusion was that the antipyretic treatment neither increased nor diminished the mortality, which was four out of the seventeen cases. His present successor has accepted my personal suggestion on the proper method of the strict Brand bath, and is *pursuing it with success* in the same wards. If we compare these statistics with those offered by Brand and the recent American and Australian figures, their utter insignificance for purposes of deduction becomes apparent. The true clinical value of the cold-bath treatment is dwelt upon in many text-books. Strümpell's Practice, a translation of which is now used as a text-book in the College of Physicians and Surgeons of New York, may be cited. Strümpell says, with his usual fairness: "There is at present no other single method of treating typhoid fever which has so numerous and evident advantages for the patient. We regard it as a duty of every physician who undertakes to treat a severe case of typhoid fever to try his best to have the bath employed."

OBJECTIONS.

Many objections to the strict execution of Brand's

method have been urged. One is the difficulty, if not impossibility, of treating patients before the fifth day. Indeed, this can only be done, it is claimed, in military hospitals or in epidemics. Every suspicious case may be subjected to the bath. It has been objected that "this is a very delicate adjustment of treatment when a patient is saved or doomed, according as it is inaugurated on the fourth or fifth day." This objection, if valid, would apply to much of our therapeutic endeavor. *Obsta principiis* is the first principle of rational therapeutics. Disease may properly be likened to a conflagration, the ease of whose subdual is in proportion to the stage at which it is attacked. In the severe types of malarial fever, for instance, one day's—yes, even one hour's—cinchonization may save the patient's life; its delay dooms him to death or to long-continued invalidism. Brand has demonstrated as clearly as anything can be demonstrated by clinical data, not from his own practice only, but from that of others also, that out of two thousand cases treated before the fifth day *not one died*. The uncertainty of diagnosis here steps in to mar possible success. Before the appearance of the spots, we cannot pronounce definitely whether we have a case of typhoid fever, acute tuberculosis, gastric fever, pneumonia, acute nephritis, or one of the exanthemata. We have the satisfaction of realizing, however, that in the large proportion of cases these diseases may readily be excluded. But we may readily escape from

the dilemma entirely if we adopt the rule to subject every case of fever whose temperature persistently marks above 103° , for several hours, to cold bathing in a mild form. Experience has taught that no harm will ensue from such a course. The systematic bath may aid us in reaching a diagnosis.

In acute tuberculosis, for instance, the symptoms will not be ameliorated, as in typhoid, and even if the bath were capable of damaging the patient's prospects, the latter cannot be done, because the disease is invariably fatal. In the low forms of the initial stage of some of the exanthemata, with high temperature, cold affusions have been found so effective by Currie, and later by Ziemssen and others, that a few ablutions or baths will surely not damage the patient's chances, but rather rescue him from the ataxic condition and save his life. In my hospital service I have directed the house staff to do so. If the disease proves not to be typhoid, no harm will be done. At any rate, the more nearly we approach the high standard of strict bathing, the more nearly we approach the low mortality. Hence, the earlier the baths are resorted to, the more strictly they are used in accordance with the directions regarding their temperature and frequency, the more completely will the toxic processes be controlled and the mortality be reduced.

One illustration will suffice. On Nov. 10, 1889, the police sent an ambulance call to the Manhattan General Hospital, for a case of paris-green poisoning

which had been found unconscious on the street. The stomach, on being washed out, was found to contain no poison. Patient's temperature was 106° F.; pulse, 140; tongue, brown and dry; he was apathetic and could give no account of himself. He had no cough; his respiration was not out of proportion to the pulse. Pressure in the right iliac region made him shrink. A graduated bath of 90° F. to 68° F., with occasional cold affusion, reduced his temperature to 101° F. in three hours; another bath, when it rose to 103° F., reduced it to 100° F. It did not again rise to the bath rule figure (103° F.). On the second day consolidation was made out in the upper posterior half of the right lung. The patient was convalescent in five days. *He was bathed on suspicion, with benefit.*

Every case of typhoid fever reaching a rectal temperature of 103° should be subjected to the bath. One of my correspondents asked: "If a patient has a temperature of 104° for an hour or two every evening, but with moderate fever for the rest of the time, and without 'Functionstörung,' should you then think it necessary to insist upon the bath?" This is a question that will frequently arise in the mind of the practitioner, who would fain shrink from the trouble, annoyance, and possible criticism of the bath procedures so long as the case presents a mild aspect. It will not be difficult for the attendant to order and insist upon the cold bath, if the patient has a temperature of 105° , with delirium, stupor, etc., but when he

appears to be comfortable, with a temperature ranging between 102° and 103° , or 104° , it does seem so glaring a violation of the long-established expectant treatment to disturb his comfort by a cold bath, that few men will have the temerity to advise it. The experienced practitioner, however, knows but too well how sadly his prognosis, derived from an early mild course, sometimes fails to be verified when, in the beginning of the third week, the first sound of the heart begins to fail, the pulse becomes rapid, the lung becomes hypostatic, haemorrhage and perforation ensue, and death closes the scene.

We rarely witness the death of a case of typhoid in the first week from excessive temperature or from failure of the nervous system; the chief danger lies in the infective process, which undermines the system slowly but surely. To meet this danger, the cold bath is our shield and ever-ready weapon. In mild cases the rise of temperature and pulse are readily combated by it, the resisting power of the disease being feeble; hence the temperature rises only at long intervals to 103° F., but whenever it does so rise the rule should be inexorable—the bath must be administered. Clinical experience demands it, and if we would receive its benefits we must obey the behest.

Is there not danger of producing lung complications by cold bathing? has been urged. This question has also been abundantly answered by clinical

demonstrations. There can be no more cold-threatening conditions than exist in the Military Hospital of Vogl, in Munich. If a combination of cold air and very cold baths do not produce bronchitis, pneumonia, and pleurisy in typhoid fever, the bath alone may be regarded as free from such accusation. Vogl treats his infectious cases in barracks, which are built of wood, like summer pavilions, resting upon pillars, which support a double floor, whose ventilation is complete; the roof, ceiling, and walls are also arranged for perfect circulation of air, as I have had the opportunity to examine personally during a recent visit. During the severest part of the winter he closes the open spaces under the roof and between the floors by simply boarding up, and starts a fire in the cast-iron stoves. All the windows remain open, unless strong winds, rain, or snow-drift forbid, which the neighboring buildings somewhat prevent. The patient is only protected against direct drafts of cold air; the windows adjoining the tubs are always closed. As the entire length of the barracks consists of windows, without intervening walls, the patients practically lie in the open air. "In severe weather we rarely can raise the temperature above 0° C. (32° F.). The fear of cold and circulating air is unjustified. I am so accustomed to hear from my visitors expressions of apprehension on the point that I do not wonder that the reader feels the same. Just as I have convinced the former, so I hope to convince the latter, that a

thorough lung ventilation protects against adhesive processes; the cooling effect of the air and increase of heat dissipation from the whole body form, together with baths, the basis of our success. An experience of ten years' conscientious observation, without prejudice, is surely entitled to consideration. I have never heard complaints nor experienced anything but benefit from the extensive and thorough ventilation of our barracks, and I feel that I have not departed from the useful. Bronchial catarrh and angina are just as rare here as in the large wards; we have never seen severe erysipelas. A very anæmic, pleuritic patient, who was sent to the barracks with a sub-febrile temperature, was transferred into the large ward when cold weather commenced. The temperature rose at once, and remained high for five days, with strong morning remission. The high temperature ceased at once upon his being returned to the barracks. The unpleasant effect upon the anæmic patient, but not upon the accompanying bronchitis, drove him back to the ward, where his temperature again rose, so that he asked to be transferred to the barracks, where he recovered. There was not a single death from pneumonia or bronchitis, and only one from pleurisy, in cases treated by strictly cold bathing and this open-air method. I could cite much other testimony on this point, but none more convincing, I trust."

On the contrary, so far from producing lung complications, the numerous cases detailed *in extenso*

by Brand and by Tripier and Bouveret and others go to prove that we have in the cold bath the most effective treatment of these complications, when they occur during typhoid fever. Only when they occur in far advanced stages of the fever, with great adynamia, the cold bath should be exchanged for that of a milder temperature and more brief duration.

The question has been asked: "Is the rule to bathe every three hours in winter, at 65° F., whenever the temperature reaches 103° F., absolute, and not to be modified to adapt it to each case?" Most assuredly I would rarely deviate from the rule except in the beginning, when patients' peculiarities may be noted; because this rule has been established by deduction from large clinical material, carefully gathered by numerous observers in different localities, in private, hospital, and military practice. It must always be borne in mind, too, that the object of the bath is prophylactic; its aim is not a mere reduction of temperature, but a suppression of the violence of the febrile movement until it has spent its force. Whoever expects to throttle the fever by the bath will surely be disappointed, for its course is as steady and inexorable as any law of nature. The temperature will almost invariably fall from one to three degrees after each bath, only, however, to rise again to within a fraction of its former rate when three-hourly examination is made. But from day to day there will be a gradual, yet steady, diminution of the average tem-

perature, which indicates that the resisting power of the system is gaining sway over the disease. This is the usual effect of the systematic cold bath, administered without fear and without favor. Whenever we attempt to substitute another form of hydriatic procedure, to raise the temperature of the bath water, to shorten the duration of the bath, or otherwise to change the rule, we must expect a change in the result. If the case comes under treatment late, the resisting power of the disease will be greater, hence the result of the bath will deviate from that here depicted. The type of severity of the disease, too, will exert its influence upon the latter. If the temperature fails to be favorably influenced by the systematic baths at 65° , a lower temperature for a more brief period, not below 60° , will be found useful in the first two weeks of the disease. Occurring later, a persistently high temperature will probably be due to complications, in the *prevention* of which the systematic cold bath has far more influence than in their *treatment*. One point should be ever present in the mind of the attendant, viz., the chief aim of the cold bath is to endow the system with power to resist the disease; hence it is all-important to begin it early, and not to expect so much, though still a considerable effect, from it when the disease has already made decided inroads upon the blood and the vital organs.

EFFECT UPON COMPLICATIONS

The salutary effect of the cold bath in prevent-

ing certain complications has already been referred to in Vogl's statistics. A more detailed consideration may serve to complete this review of the subject.

It has been asserted that the cold bath increases the tendency to intestinal haemorrhages by driving the blood from the periphery to the enfeebled intestinal vessels. Tripier and Bouveret met only four cases among 233 thus treated; of these two died, and none showed any connection with the bath. They conclude that their own experience proves that intestinal haemorrhages are less frequent under hydriatic treatment. Brand, who has studied every phase of this subject with an eye single to the elucidation of the truth, has sifted the histories of hundreds of cases for this purpose. He has gathered 4,995 cases of typhoid fever, in which 155 haemorrhages were noted, 35 of which proved fatal. Hence the frequency is 3.1 per cent., and the mortality 0.6 per cent. On the other hand, among 4,890 cases not treated by water, he discovered haemorrhages 271 times—5.6 per cent. Goltdammer, who is not so warm an enthusiast on the efficacy of strict cold baths as Brand, furnishes larger statistics (nearly 20,000 cases), from which he concludes that the cold bath has no influence in producing intestinal haemorrhages. Vogl noted among 251 cases treated by the strict cold bath only two cases of bloody stools. All evidence, therefore, tends to prove that, so far from being influential in the production of haemorrhage, the cold bath actually renders it less frequent.

and more mild and tractable, if resorted to very early in the disease.

"That the alteration in Peyer's glands will not go beyond the stage of infiltration, if treatment is instituted before 'the fateful fifth day,' is another prediction that raises dubious questionings," says a writer in the Medical Record. I reiterate the reply made to this doubting Thomas, because it is a doubt which is but the legitimate offspring of the experience with the expectant treatment hitherto in vogue. Fortunately for the patients, but unfortunately for our pathological enlightenment, the opportunities for autopsy are exceedingly rare in cases treated by the strict cold bath. Only two cases, in which death occurred from other causes, but which had been bathed before the fifth day, furnish evidence on this point. One case is reported in Lyon Médical, No. 14, 1886, and another by Brand in 1883. In the former, dying on the twenty-first day of a typical typhoid, there was found no loss of substance, old or new, in the intestine. In the latter, also on the twenty-first day, no ulceration, cicatrix, pigmented spots; only fresh infiltration. "If diarrhoea, meteorism, haemorrhage, and a dry, red tongue are indications of ulceration of the intestinal glands, the absence of these symptoms in the large proportion of cases treated by the strict cold bath must be accepted as logical evidence of the absence of ulceration." Vogl's testimony on this point is strikingly conclusive, and must carry conviction, be-

cause it emanates from the comparative experience of many years in the same class of patients—soldiers. He says: “The diminution of intestinal symptoms is a very evident effect of the cold bath; a few trials will convince and surprise anyone of its success. Among 221 cases there was a daily average of only 0.7 per cent. of diarrhoeal stools; while in the cases treated with a combination of baths with medicinal antipyretics, the average was 1.9 per cent. of diarrhoea. Never was it necessary (in 251 cases with carefully written histories) to resort to opium and bismuth; meteorism, with tense abdominal walls, was observed only in cases received late; it was diminished by the baths. If inappropriate diet is capable, as we know, of aggravating the intestinal symptoms, and if proper diet is capable of preventing or ameliorating them, is it unreasonable to accept the proposition that the cold bath influences favorably the local process, which is but one of the manifestations of the general infection?”

Pleurisy offers an indication for cessation of the baths, because it demands rest. If, however, the temperature be persistently high, with nervous symptoms threatening, these must be combated by the bath, even though pleurisy be present. Brand has never observed pleurisy in his 335 cases; Rolet, in 1,005 cases, only four times; Mollière, only once in 234 cases. According to Betke, the mortality from this complication, which is rare in the cases treated by the bath, was only 0.2 per cent. in 5,075; while in 1,420

cases treated medicinally it was 1.4 per cent. I have had one death from it in the Manhattan Hospital.

Severe cough and paroxysms of dyspnœa are not rare when patients feel the first shock of the bath; but these symptoms soon subside—Tripier and Bouveret mention five cases in which they persisted so as to require cessation of the baths. In some cases the oppression of breathing is voluntary; the patient either imagines it, or he simulates it in order to alarm the attendant and prevent a continuation of the bath. By reassuring such patients their apprehensions may be overcome. If cyanosis and syncope occur, the bath must be discontinued, but in severe cases this should not deter us from renewing it. The graduated bath or the wet pack sometimes helps these cases. The cough produced by the shock from the cold water is advantageous, as it relieves the bronchial tubes of mucus, and stimulates pulmonary circulation.

Hoarseness does not forbid the bath, but *œdema of the glottis and pericarditis* demand its cessation.

Collapse is a contra-indication to the strict cold bath, but may be effectively met by the warm half-bath with cold affusions, as elsewhere described.

Syncope and fainting have been charged as causes of death due to cold bathing. A large experience readily disposes of this bugbear. Death from sudden heart-failure is not an unusual occurrence in typhoid fever; the cold bath is, as I have shown, the best weapon against it. Körber has shown that in 874

cases of typhoid treated by cold baths, only ten died immediately after the bath, and these were very desperate cases. "What may be especially dwelt upon is the fact," says Vogl, "that in thousands of baths not a single time was collapse to be observed, either before, during, or after the bath."

Albuminuria, infectious nephritis, œdema, are not only not a contra-indication to baths, but the latter are of the greatest value in these complications; they favor diuresis and relieve the kidneys. Only when extensive œdema or anasarca occurs, which renders it difficult to handle the patient, should the baths be discontinued.

Vomiting and colic pains are not rare; they offer no bar to the bath, unless following invariably after it.

Perforation and peritonitis strictly forbid the bath, because it involves disturbance of rest, which is one-chief therapeutic resource.

The claim that these serious complications are sometimes due to the bathing has not only been refuted by abundant and convincing statistics, with case histories, but the fact has been established that they have been reduced in frequency. Murchison's statistics of 1,271 cases give 196 cases of perforation (11.38 per cent.). Brand's 4,884 cases give 12 perforations (0.24 per cent.).

Intestinal haemorrhage, when severe and accompanied by general symptoms, such as pallor, small pulse, cold extremities, subnormal temperature, for-

bids the continuance of the bath. A slight discolouration of the stools need not deter the attendant from continuing the baths. Brand has continued them in six cases with good effect, and I have seen no harm from them in one case. Brand distinguishes the congestive haemorrhage which occurs mostly before the fifteenth day, and which does not forbid the bath, from that occurring later and due to diseased action in the blood-vessels proper. If the haemorrhage is pronounced, rest is imperative, and this alone requires abstention from the bath, which, however, may be again resumed, so soon as the haemorrhage is stayed, if the intensity of the fever demands it. Indeed, this should be a rule in all cases in which the bath has been suspended for cause, for to it we may intrust the invigoration of the patient, which alone can tide him over the ever-present dangers due to the fever processes. Free perspiration does not contra-indicate the bath; the patient should be dried with friction before being placed in it.

Bed-sores (if large) forbid the bath because disturbance of the patient interferes with a strict anti-septic treatment. General ablutions and cold compresses should be substituted.

Erysipelas does not present a reason for discontinuing baths, so long as there is no extensive destruction of tissue accompanying it.

Late cases, viz., cases coming under treatment after the second or third week, do not forbid the bath,

although they require a more cautious application and higher temperatures. The effect of these baths will not be striking, and the prognosis cannot be expressed as being so favorable. Hospital histories demonstrate that many desperate cases, which under medicinal or expectant treatment were lost, now recover under judicious hydriatic treatment. The condition of the heart is the chief index to the bath, or rather to the kind of bath. To react from a bath of 65° F., a certain integrity of the central nervous system and of the heart-muscles is required. This is almost surely impaired by a long-continued febrile process, even if no actual organic degenerations have been developed. Hence the graduated bath of Ziemssen or the wet pack is more applicable, or a warm bath with cold affusions, followed by friction. These may restore the lost stamina and enable us to resort to the cold bath if the symptoms demand it.

In a case which I had the pleasure of seeing with my friend Dr. Rodenstein lately, there was muttering delirium, picking at the bed-clothes, subsultus, and stupor. I advised a bath at 70° F. for fifteen minutes, with affusions over the head and shoulders at 60° F., the patient being well advanced into the third week. Only four baths were required to reëstablish a favorable condition, which led to recovery.

The analogy between the treatment of typhoid fever by strict cold bathing and the treatment of severe types of malarial fever by quinine is so striking

that I desire to call attention to it, in order to illustrate the necessity of precise attention to detail. Anyone who has, like myself, treated a large number of cases of the severe types of bilious, remittent, and congestive fevers on the Southern river-banks, has realized how important it is to cinchonize the patient at the earliest possible moment, in order to prevent the recurrence of the paroxysm, which brings parenchymatous changes in its train. When the latter are once established, the fever continues despite the best directed administration of quinine. The antagonistic specific effect of quinine is no longer required; we have a hepatitis, a gastritis, or splenic enlargement to treat, with which we are unable to cope successfully. But if the malarial element be not wisely met by quinine, the patient will surely die from the combination of the malarial and parenchymatous diseases. So it is with typhoid fever. The cold bath represents the effect of quinine in malarial fevers; although it has not the specific antidotal effect, the cold bath applied in the early stage has the same prophylactic effect in preventing parenchymatic degenerations. If the latter have occurred, by reason of the neglect of the cold bath, we are called upon to meet them by stimulants, rest, etc., but at the same time we may resort with advantage to some modification of the bath as a potent auxiliary.

SUBSTITUTES.

One of my correspondents has asked an opinion

regarding the substitution of the cold pack for the bath. "What theoretical or practical reason," says she, "is there for considering (at least until tried in the individual case) that the cold pack, repeated every ten minutes for a time, will not act as an antipyretic and stimulant as successfully as the bath?" There are both theoretical and practical reasons to establish the inferiority of the pack. As an antipyretic the cooling effect of the pack is limited to the first few minutes; the vessels are rapidly contracted by the shock to the peripheral nerves; the cooled blood is sent to the interior only until reaction is established. Now, however, the sheet surrounding the heated body rapidly absorbs its heat; there being no accession of cold, as in the bath, the now dilated superficial vessels do not receive cooled blood to carry to the interior, as in the cold bath. A second pack is required. The patient, now warm, his superficial vessels dilated far better than in the cold bath (with friction), is wrapped again in a sheet wrung out of water at 60° . The stimulating effect is pronounced; the patient is refreshed; the blood, cooled for a few minutes on the surface, rapidly diffuses its lowered temperature in the interior. But very soon equalization of temperature between the body and sheet takes place, which, according to experiment, requires about ten minutes. A third and a fourth pack must be resorted to, each one reducing the temperature slightly by the process indicated. Liebermeister has demon-

strated by actual trial that four successive packs, of ten minutes each, reduce the temperature only as much as a cold bath of ten minutes. Hence it would require about five or six packs, lasting over an hour, to produce the same effect as one of our 65° Brand baths of fifteen minutes. Aside from the trouble and time, and the disturbance of the patient involved in six packs, even if we grant the antipyretic result, the stimulating effect cannot endure unless the superficial vessels, relaxed as they are by the last pack, are again made to contract by a cold half-bath or ablution. It is a well established principle in hydriatic procedures never to administer a wet pack without following it by a cold half-bath or some substitute for it, because the object of all cold hydriatic procedures is reaction, and consequent tonic effect.

The suggestion of my correspondent, however, is not without value; for the wet pack, not well wrung out, is a valuable auxiliary to treatment in those cases in which, by reason of great debility or marked antipathy to the cold bath, or any unpleasant effect of the latter, a substitute is required, as will be shown later.

In children under ten years old the bath at 65° should be administered with caution, beginning with 85°, and gradually lowering the temperature of each bath to ascertain the reactive capacity and the resistance of the fever. In these patients the wet pack and graduated bath are valuable auxiliaries.

It will be observed that, while the rule to bathe every case of typhoid or suspected typhoid regularly every three hours, in water at 65°, whenever the body temperature reaches 103° in the mouth, is to be rigidly followed, there are conditions referable to the patient, or to the type and stage of the disease, which in hydriatic treatment demand as judicious modifications as in every other valuable therapeutic application. On the other hand, the more thoroughly we become familiar with the cold-bath treatment, the more rare will be the apparent indications for modifying the temperature or quality of the bath. An accumulated experience will develop a remarkable universality of the rule.

It has been commonly supposed that Brand's rule is inflexible, and it has for that reason been condemned. That this is an error may be gathered from the following extract from a letter received on Feb. 15th from Dr. Brand. Referring to a case where the bath treatment had been detailed in one of our journals, he says: "By following my rule is not understood such treatment as was given by Dr. — to the child, which was so far reduced in strength and nerve power that it should not have been put into a cold bath, but into a warm one, until it gradually became accustomed to the cold, for twenty hours. To me it is surprising that Dr. — did not obtain greater disadvantage from the low temperature used in this case; it was a special piece of good luck. *I always use*

warmer baths for twenty-four hours, usually of the room temperature, if the patient has been ill over four days; often, also, from the beginning." [The italics are mine.] From this extract it will be evident that Brand does not advise plunging every case into a bath of 65° F. without regard to individual condition. The truth is that in no method of treatment is good judgment more necessary than in the management of typhoid fever by the cold bath. Failures are constantly reported and attributed to the cold bath, when the real cause lies in its improper and faulty application.

A slovenly application of the bath, or the substitution of some other method, dictated by the fancy or inventive genius of the attendant or by his fear of cold water, must fail and cause discouragement. A small personal experience, or information obtained from hearsay, which may have been unfavorable in one or more cases, may deter some from adopting cold baths. An intelligent hospital physician, professor of pathology in a large medical school, informed me that he was prejudiced against it because in his early career he witnessed, while serving as hospital interne, the death of a patient who, being wrapped in a sheet, was placed upon a Kibb  cot and sprinkled with ice-water! This method is not, so far as I am aware, recommended in typhoid fever by any author. It seems to be a modification, erroneously believed to be a milder form, of Currie's cold affusions, in which the stimulus produced by the impingement of a forcible

stream of cold water upon the naked skin favors rapid reaction, with its resultant stimulation of the nerve-centres. The effect of such an ice-water pack must be to produce a cutis anserina, contracting all the peripheral vessels to the utmost, and driving the blood within. An elevation of the temperature must ensue, due to the compensating effects of the heat-regulating centres, and the prevention of heat-dissipation by the cutis anserina. As the superficial cooling penetrates as far into the mouth or rectum as the thermometer can reach, we may thus obtain a false impression of the true internal temperature.

I doubt not that Duschek's bad results, reported by Dr. Krügkula in the Archiv für Klinische Med., Bd. 3 and 4, may be traced to a similar faulty method. Dr. Krügkula reports "sixty cases of typhoid fever treated by cold baths, with a mortality of 28.3 per cent., while of twenty-six cases treated by other measures, only 26.9 per cent. died," and that "the bath treatment had no influence upon the final issue, the complications, and the duration of the disease." Let us analyze what Dr. Krügkula calls a cold bath. In this clinic "patients were laid into a bath of 60° to 65° F.," without friction, "for ten minutes." This was continued from 6 A.M. to 10 P.M., only when needed to reduce the temperature. The deleterious effect of this faulty method is self-evident to anyone who has followed me in the study of the rationale of the cold bath.

The resort to the cold bath after failure of other measures, as a last resource, is a fatal error, not only for the patient, but for the method. I have heard one of the ablest teachers of medicine, a physician to two hospitals, say in a discussion: "When antipyretics fail to reduce the temperature, the cold bath (not specifying temperature and duration) is useful." Useful, indeed! When a man has nearly starved to death, bread is useful. But it often comes too late to restore vitality lost beyond reach.

I have heard another teacher and hospital physician declare in the Academy of Medicine that he had not found the cold bath of value in typhoid fever. I happen to know his treatment of one case to be placing the patient upon a covered table, wrapped in a sheet, and soaking the latter in ice-water poured from a carriage sponge. She died, although her temperature was reduced from 106° to 101° . Why will men persist in modifying Brand's method until nothing is left of it but the water, and then claim that it fails in their hands?

SUCCEDANEA FOR COLD BATHS.

Under certain conditions it may be impossible to adopt the strict bath treatment. Some of the substitutes for it have been referred to in the description of the technique. With timid patients, or when the latter are under the control of timid people, whose abhorrence of cold water must be conciliated, a mild

hydriatic procedure, beginning with an ablution and ending with the sheet-bath (see description), may, by its beneficial effects, overcome objections. The sheet especially forms a valuable substitute for the bath in country districts where tubs cannot be obtained. When linen sheets are not available, linen tablecloths, or even old, well-worn cotton sheets, will suffice. (See description.)

In a recent case which I had the pleasure of treating with Dr. Frank H. Daniels, in private practice, the value of this bath was well illustrated. The patient, a young student, coming under our observation on the seventh day, with a morning temperature of 105° , delirium, etc., presented on the eleventh day an enormous crop of spots. Finding it difficult to obtain a six-foot tub for the tall boy, the sheet bath was thoroughly applied every two hours at 65° , with local affusions at 60° , with the result that, with continuous wet abdominal and chest compresses, only four tub baths were required to subdue the main force of the fever. He had a normal temperature on the twenty-second day, and made an uninterrupted recovery.

There is one method of bathing, which has been briefly referred to in the preceding pages, but which is entitled to a more extended consideration in this connection on account of the great repugnance to cold bathing existing among the people. I refer to the so-called *permanent bath*, which is claimed to have

been instrumental in reducing temperature and abbreviating the duration of the disease.

PROLONGED WARM BATHS.

As has been stated above, Dr. L. Riess, of Berlin, has introduced the prolonged bath (called also permanent) for the treatment of typhoid and other fevers, with such an array of statistics and clinical data that the consideration of this method becomes imperative. The latter consists in immersing the patient into a bath of 88° F., prepared as has been already shown (see description), with a hammock to afford comfortable support. This he advises to be done whenever the rectal temperature reaches 102° F. The patient is allowed to remain in the bath usually during the day only, but, if necessary, day and night, until his rectal temperature registers 100° F. He is now removed, and again placed in the bath when he registers 102° F. If the temperature falls too slowly, or rises in the bath, an occasional short bath or 60° F. or a moderate dose of antipyrin is slipped in. This method is certainly much more free from trouble and more agreeable to the patient, when he becomes accustomed to it, than the cold bath, and may thus be substituted for the latter in some instances.

Riess holds (monograph from author, and Archiv für Klin. Med., 1889-1890) that the original views of treatment in which temperature reduction was the

chief object have been abandoned, at least so far as the methods connected with cold baths are concerned. But this in no way argues against the value of his permanent baths. On the contrary, he claims always to have held that elevation of temperature is not the essence of fever, but only its chief symptom, and that the direct influence of the organic disturbances is quite as important. The ventilation of the question seems, according to Riess, to have lessened the estimate of temperature-reducing measures with some physicians, so that many regard it as possible to substitute for these the purely expectant methods. Many of these, which claimed to further the practical use of antipyrin (see Naunyn, Archiv für Klin. Med., xviii) have damaged the cause. He found antipyretics useful for reducing temperature, but they did not influence other symptoms. Hence he returned to baths which would slowly but permanently abstract heat. He appeals to his clinical results, 809 cases treated in the Allgemeines Krankenhaus zu Friedrichshain. Although a mortality percentage does not prove much, because many hospital cases could not be saved by any treatment, he does claim that he can show the lowest mortality of any hospital in the city, and in his own hospital the mortality has been reduced from 10 per cent. to 8.5 per cent.; 12 deaths were caused by pneumonia, 4 by haemorrhage, and 10 were uncomplicated. The duration of his cases was decidedly influenced, he claims, contrary to the accepted

doctrine with regard to the course of typhoid fever. Although most cases came in after the eighth day, the average stay was 17.9 days, including 740 cases that recovered. Three hundred and one cases coming in before the sixth day remained 15 days; the others, 17.7. In 341 cases which came in before the sixth day, the duration of fever averaged 15.5 days; admitted later, 399 cases averaged 19.9 days—certainly a much shorter average duration than is usually observed in so large a number of cases. Among the deaths there were 10 uncomplicated, 18 with pneumonia, 12 severe throat affections, 12 perforations, 3 intestinal haemorrhage, 3 purulent pleuritis, 3 chronic pyæmia during convalescence, and the remainder were one each of gangrenous phlegmon, gangrene of the lung, noma, haemorrhagic nephritis, dysentery, pelvic tumor, and old heart lesion. Hence, only 1.2 per cent. died without some complication; 34 per cent. of those dying were admitted before the sixth day of illness, 65.2 per cent. after the sixth day, the average date of admission of the fatal cases being, therefore, nine and a half days after inception of illness.

The effect of this treatment upon individual symptoms must be carefully studied. Upon the cerebral disturbances these prolonged baths seemed to act more favorably even than short cold baths. If this had not been the case, it would have been impossible to detain somnolent and delirious or violent cases in the bath without a much greater num-

ber of nurses. The fact was, however, that these cerebral symptoms receded without exception after the first prolonged bath; the actual *status typhoidus* disappeared permanently on the second or third day.

Influence upon the circulation was also favorable. Only during the first quarter of an hour did the heart-action seem embarrassed, the pulse becoming small. And this should be remembered, not to discourage the attendant, because it very soon becomes stronger and slower.

Lung complications were never aggravated, but, on the contrary, improved, and rarely occurred in cases admitted early. The intestinal lesions, too, were favorably influenced; diarrhoeas diminished so rapidly that they never interfered with the continuance of the bath. Complications were diminished. There were only 2.6 per cent. intestinal haemorrhages, and 1.6 per cent. of perforation peritonitis, one of which recovered. There were 5.5 per cent. pneumonia, 2.1 per cent. throat affection, and other complications or sequelæ were very rare. Only furuncles and subcutaneous abscesses were increased somewhat (3.4 per cent.).

Riess concluded, therefore, and with justice, that the treatment of typhoid fever by the permanent baths has an especially favorable effect because it does not reduce the temperature rapidly, and does diminish the severity of other symptoms, shortens the duration of fever, and reduces the mortality to a low point. Riess furnished in connection with this essay, read

before the Science Congress at Heidelberg in September, 1889, six temperature charts, which graphically illustrate the method and results. I select two of these, giving the temperature, with duration of baths and remissions. Hebold, a bricklayer, 45 years old, was admitted on the sixth day of typhoid, with a temperature of 104° F. He was in the bath thirteen hours, and was removed when he reached 98° F.; out of bath thirteen hours; replaced at 101.6° , etc.

OUT.	TEMP.	BATH.	TEMP.	OUT.	TEMP.	BATH.	TEMP.	OUT.	TEMP.	BATH.	TEMP.
	104°	18 hrs	98°	13 hrs	101.6°	5 hrs	99°	6 hrs	101.8°	4 hrs	99°
5 hrs	101.6°	5 "	99.1°	5 "	101.6°	5 "	99.3°	7 "	101.6°	6 "	99°
4 "	101.6°	7 "	99°	7 "	99°	5 "	99°	6 "	101.8°	6 "	98.5°
6 "	101.6°	6 "	99.6°	6 "	100.6°	7 "	98.4°	6 "	101.6°	8 "	99.2°
9 "	101.6°	5 "	99.6°	18 "	101.8°	7 "	98.2°	23 "	101.6°	7 "	97.4°

This case was continued until the fifteenth day, from which time he remained normal.

Case of Huthe, laborer, æt. 73:

OUT.	TEMP.	BATH.	TEMP.	OUT.	TEMP.	BATH.	TEMP.	OUT.	TEMP.	BATH.	TEMP.
16 hrs	104.2°	11 hrs	97.5°	5 hrs	102.4°	4 hrs	97.9°	4 hrs	101.6°	5 hrs	99.2°
3 "	103.8°	7 "	98.4°	4 "	102.4°	11 "	97.4°	3 "	101.6°	3 "	101.6°
18 "	104°	8 "	97.6°	9 "	101.6°	6 "	97.4°	17 "	102.4°	8 "	98.8°
refused											

He now (from the thirteenth day of the disease—the fifth day of treatment) remained normal.

It will be evident that this method of bathing has a future. It seems to be more free from trouble and annoyance to the patient and attendants, and it is not difficult to execute. My personal experience

with it in acute diseases is limited to one case of subacute bronchitis in a boy, one case of typhoid fever, and one case of acute bronchitis, in which it acted well and demonstrated its practicability. I propose to utilize it further at the first opportunity.

I am disposed to believe, from the experience of Brand, Vogl, Jürgensen, Wilson, and my own, that of the 34 per cent. of those dying who had been admitted before the sixth day of illness, most, if not all, would have been saved by strict cold bathing, and that a large proportion of the other cases (averaging less than ten days ill when admitted) might have been saved. Still, the results are so far better than those of the fatal expectancy that it seems ungrateful to the courageous and original clinician Riess to cavil at his excellent results.

SUMMARY.

The reader who has patiently followed me in the somewhat elaborate description of the hydrotherapy of typhoid fever may claim, with justice, that he possesses an *embarras de richesses* which renders it difficult to select. Briefly stated, we have the following methods:

The strict cold bath, or Brand treatment—a bath at 65° F. for fifteen minutes, whenever the temperature reaches 102° *in recto*. The statistical result (reduction of mortality to 2.7 per cent.), corroborated, as has been shown, in various countries, declares this.

to be the treatment *par excellence* of typhoid fever. But if for any reason this bath cannot be systematically given, or if the attendant is not convinced of its necessity, recourse may be had to Ziemssen's method.

Ziemssen's graduated bath: water at 90° F., gradually reduced to 72° for half an hour. Ziemssen especially recommends these baths as most useful in private practice, and, after an experience in several thousand cases during twenty years, he orders the temperature according to the patient's condition. In a weakly, nervous female, for instance, in the second week of a neglected typhoid, only warm baths of 88° to 92° should be risked, with probably a brief cold affusion or pack. The temperature of the water may then be reduced, if the effect is satisfactory, and the number of baths increased. The sum of all the symptoms and the influence upon the entire case, and not the temperature effect alone, should be the guide.

The statistical record of this treatment in the Tübingen University Clinic from 1877-1887, in 2,000 cases, shows a mortality of 9.6 per cent.

The prolonged warm baths of Riess offer a valuable substitute, the statistical evidence being *more favorable* even (mortality of 8.5 per cent.) than in the Ziemssen bath, and they are certainly less troublesome and distressing to the patient and attendants.

Many eminent clinicians exercise judgment in selecting from these methods a procedure which com-

bines mildness and efficiency. Prof. Fürbringer, of Berlin, for instance, orders, whenever temperature exceeds 103° , a bath of 90° every three hours, sometimes reduced to 86° , or even to 77° F.; in feeble conditions a bath of 96° , with cold affusions. When nervous symptoms are not pronounced, he waits with the baths until 104° F. is reached.

This cautious method does credit to the eminent clinician, especially as his cases are usually admitted late. This is the cause of his serious complications, in which even this mild treatment judiciously applied seemed to triumph, for his cases are of the most unfavorable quality; many patients are only “unloaded into our institution for the purpose of dying.” Three cases only out of nine of intestinal hæmorrhage proved fatal, and three undoubted intestinal perforations, with peritonitis, recovered. His mortality in 155 cases was 10 per cent. Goltdammer is an advocate of still milder water treatment, relying chiefly upon nutrition, and regarding the cold bath as a secondary measure. His mortality in 72 cases was 20 per cent.

The difference between the timid bath practice of Goltdammer and the bold practice of Brand, Vogl, Jürgensen, Glenard, and J. C. Wilson, determines precisely the difference in their mortality and complication percentage. The physician whose object it is to render the patient comfortable—to placate the disease, as it were—will be content with cold sponging. The

inadequacy of this method has been exposed by Peabody. It does not prevent complications nor moderate the course of the disease. The physician whose chief goal is the reduction of temperature will resort to cold compresses, the ice coil, iced air, and to an occasional bath, with the addition of medicinal antipyretics. This method has been proved utterly inadequate by statistics.

If, as those most experienced in the method are agreed, our therapeutic efforts should be in the direction of maintaining the systemic functions, we have in the methodical cold bath the most effective means, because it not only reduces the temperature, but it refreshes and vivifies the nerve-centres which preside over the functions upon whose integrity depends the nutrition of the patient.

In closing this somewhat lengthy review of typhoid fever management, the author would call attention to the fact that he has endeavored to present the subject fairly, imbued with the solemnity of a task which may be the means of saving large numbers from the fatal grasp of the relentless scourge. The evidence before us is clear and incontrovertible. Upon our conscientious, unbiased, and fearless judgment and action rests the weal or woe of those who commit their lives into our keeping.

CHAPTER VII.

CLINICAL ILLUSTRATIONS.

The limits of this volume forbidding a detailed discussion of the practical application of water in diseases, the following summary must suffice, in addition to what has already been referred to under the various headings.

Pneumonia.—In this disease cold baths have been lauded by Jürgensen (*Volkmann's Sammlung*), who has, however, found few imitators of his heroic practice, viz., baths of 70° to 60° , with large quantities of stimulants to counteract cardiac depression. Dr. Vogl, Chief of Munich Military Hospitals, has in a written communication informed me that he has found the baths, as applied in typhoid fever, of great value in pneumonia. Being a very careful and conscientious clinician, however, he is unwilling, upon the strength of only a few hundred cases, to furnish practical deductions. The gentlemen who report therapeutic successes, sweepingly condemning cold baths in this or that disease upon results derived from a few cases, may here draw a valuable lesson of caution. This has been the author's reason for withholding, in this work, his own experience as an argument wherever larger statistical material could be brought to bear upon the subject from other sources. In the croupous pneumonia of children my experience

has been sufficiently large to warrant the deduction that we possess in the cool bath, 95° reduced to 80° for fifteen minutes, with friction during the entire bath, a means of aborting the disease if seen early, and hastening resolution if seen late. One case may be cited as an illustration of the method pursued:

Croupous Pneumonia.—Edith G——, æt. 11, was seen Jan. 4, 1890, with pneumonia of posterior upper third of left lung. Temperature ranged from 102° to 104°; disease spread over entire posterior portion; respiration greatly embarrassed. The disease passed through second stage, resolution beginning on Jan. 10th. This was proceeding well when, on the morning of Jan. 11th, her temperature ran up to 104°; respiration, 45; pulse, 140. She became cyanotic. The upper portion of right lung now presented fine crepitant râles. Ordered ammonia carb. and digitalis and stimulants. Poultices, which had been used, were extended to entire back. Dr. A. Jacobi saw her in the afternoon, and advised oxygen inhalation to remove impending suffocation. On the following day at noon her condition was still more serious, breathing being greatly embarrassed; she had not slept during the night. Dr. Jacobi saw her in the afternoon and agreed with me that the case looked exceedingly desperate. We agreed to give her a tub bath of 95°, reduced to 85°, for twenty minutes. Temperature before bath was 106°; respiration, 60; pulse, 160. A severe diarrhoea had resulted from the

carb. ammonia. Her face was bathed in ice water before she was carried to the tub. Gentle reassurances overcame the anxiety of the patient while in the tub, before entering which she had brandy, 3 ij. On being removed, somewhat shivering, she was wrapped in a linen sheet and covered with blankets.

She fell asleep, and was not disturbed for two hours. The breathing became less labored; she resumed her sleep after clothing was changed and poultice reapplied. Six hours after the bath the temperature was 101°; pulse, 150; respiration, 48. On the following day Dr. Jacobi was unable to see her; the temperature rose in the afternoon to 103°. A bath of 95° reduced to 90° was given, with the result of reducing the temperature to 102°; respiration, 30; pulse, 120. Stimulants and nourishment were continued. The case progressed favorably from that time, the most striking feature being that the right lung, which was last attacked, immediately began to clear up, and was entirely free from all râles four days before the left lung. This case, being carefully observed, affords an undoubted evidence of the abortive power of the bath when used in the earliest stage.

The following case from the New York Juvenile Asylum is also interesting, the record being made by Miss Wald, in charge of the hospital:

Thomas Lazarus; age, 12 years; pneumonia in left lung, posterior; admitted April 5th; temperature, 103½°; respiration, 36; pulse, 128. Ordered: Calo-

mel, gr. iv; Rochelle salts, 3 iij. At 1 P.M. bath for twenty minutes, 95° to 85° . Before bath: Temperature, $105\frac{1}{2}^{\circ}$; respiration, 60; pulse, 132. After: Temperature, $101\frac{1}{2}^{\circ}$; respiration, 64; pulse, 112; and patient's condition during afternoon poor, face and finger-tips cyanosed, extremities cold, breathing shallow and difficult. Ordered whiskey, 3 ij every two hours; tr. digitalis, gtt. iij every quarter-hour.

4.30 P.M. Temperature $105\frac{1}{2}^{\circ}$, but condition still too low to risk moving.

7 P.M. Placed in pack, 60° , for one hour; then rapidly sponged off, and temperature unaltered. Bath given as before, but fifteen minutes. Before bath: Temperature, $105\frac{1}{2}^{\circ}$; respiration, 56; pulse, 140. After: Temperature, $100\frac{1}{4}^{\circ}$; respiration, 44; pulse, 122. Bath repeated at midnight, and not long afterward the patient fell asleep; general appearance improved.

April 6th: Baths for twenty minutes given every four hours; much quieter.

April 7th: Baths at 5 A.M. and 8 A.M. After reacting fairly well from latter, about 9 A.M. condition changed, face assuming pinched expression; cyanosis marked; pulse faint and thready, and breathing shallow and husky. Gave carbonate ammonia, gr. j; tr. digitalis, gtt. iij; and whiskey in repeated 3 j doses; under which he improved. Bath at noon and 4 P.M. Before bath: Temperature, $106\frac{1}{6}^{\circ}$; respiration, 72; pulse, 152. After: Temperature, $104\frac{1}{8}^{\circ}$; respiration,

52; pulse, 128. Cough when painful is quieted with small doses of morphine.

April 8th: Appearance brighter; easier breathing. At 6 P.M. highest temperature; bath given. Before bath: Temperature, $106\frac{1}{2}^{\circ}$; respiration, 58; pulse, 136. After: Temperature, $103\frac{1}{8}^{\circ}$; respiration, 48; pulse, 128.

April 10th: Breathing labored and irregular; compresses, 60° , to chest, changed every half-hour.

April 12th: Compresses removed at 7.30 A.M.; by noon respiration 72, when they were resumed; by 3 P.M. had again fallen to 48.

April 14th: Digitalis discontinued; whiskey decreased; muriate ammonia, gr. v, every two hours.

April 16th: Sleeps all night; coughs very little; eats with good appetite. All medication discontinued.

April 19th: Convalescent.

I have numerous histories and charts demonstrating an equally rapid influence upon the course of the disease and comfort of the patient. Croupous pneumonia in children is not a very fatal disease, but among the poor classes, which furnish the patients at the asylum, it was far more fatal before the bath treatment was adopted.

We have large clinical confirmation of the value of hydrotherapy from sources which cannot be doubted.

A scientific clinical demonstration of the general wet pack in pneumonia is furnished from Kussmaul's clinic (Berl. Klin. Wochenschr., 1888). Sheets were

dipped into water of 68°, and in these the body was entirely wrapped, except the arms, and covered with a blanket and rubber sheet. The patient remained a quarter of an hour, or longer, if he felt comfortable. Decrepit and old patients were not thus treated. The patients, almost without exception, felt comfortable, dyspnoea was diminished, and sleep was induced, although the temperature was reduced only a few tenth-degrees. A thorough deviation to the skin was the chief aim in view. It will be noted that Kussmaul has here confirmed by valuable clinical observations the theoretical conditions aimed at by Dr. A. H. Smith, to which reference will be made later.

Dr. Fenwick, of the London Hospital, has given to *The Lancet* an analysis of 1,000 cases of pneumonia seen in that institution during the last ten years. Cases admitted shortly before death took place, or twenty-four hours before a critical turn in the disease, are omitted from this report. In the sthenic cases, which numbered five hundred, the treatment was generally along the three general courses described as follows:

First. Treatment by means of hot applications to the chest, in conjunction with remedies having tonic and expectorant properties. The mortality in this class of cases exceeded 20 per cent.

Second. Cases in which the only treatment was by quinine in large doses. The mortality here exceeded 20 per cent.

Third. Cases where the treatment was by various antipyretic measures. In twenty-six of these, cold applications to the chest were employed, with a mortality of 15 per cent.

The cold pack was tried in an equal number of cases, with about the same mortality. Cold sponging, used in fifty-six cases, had a mortality of 13 per cent. The "ice cradle" was used in forty-three cases; mortality only 7 per cent. By all the various cold applications 108 cases were treated, with 10 per cent. of failure. By all other grouped phases of treatment the losses were double those by the cold method. Stimulants were given in these latter cases whenever indicated. Cold appears to be the best of the antipyretics for the class of patients with which Dr. Fenwick has to deal, chiefly for the reason that it has less of depressant action upon the heart than antipyrin, quinine, etc. In the earlier stages of the disease the true treatment involves a reduction of the temperature without cardiac depression. In the later stages the pulse is the great guide for treatment in the matter of strengthening the recuperative forces by means of stimulants. In many cases camphor, digitalis, and alcohol will not be needed, but in impending cardiac failure these agents become vastly important. The period of crisis, also, is attended with especial dangers referable to cardiac incapacity, and it is necessary to be watchful and guard the patient, at this stage, by means of alcoholic and other suitable forms of stimulation.

The aim of the author being to give a perfectly fair presentation of the subject, this contribution from a well-known clinician will prove valuable in molding opinion.

RATIONALE.

If a therapeutic measure may be explained upon rational principles, the empirical results obtained from it are at once confirmed. It is a conceded fact that in pneumonia the right heart is working at great disadvantage, because it is driving blood through obstructed vessels, also that an elevated temperature is crippling its nerve supply, which is already menaced by decreased oxygenation of blood. What remedy will fulfill all three of these indications, viz., reduce the temperature, tone up the heart, and refresh the dulled ganglia?

Clearly the cool bath meets these indications. Jürgensen has been very successful with the *cold* bath, but, as this seems to be a heroic measure, we may be reassured by a logical rationale of its action. The *cool* bath not only meets the above-stated imperative demands of the tottering organism, but it fulfills also the indication first clearly brought out by Dr. Andrew H. Smith—the widening of the peripheral blood-stream. This is indeed the key which explains the clinical fact referred to by Jürgensen (but erroneously explained by temperature influence alone): that when the crisis occurs suddenly, as it usually

does in pneumonia, the dyspnœa and heart weariness disappear at once, although the local inflammatory obstructions are still present at that moment. The explanation of this remarkable phenomenon is to be found in the fact that the sudden fall of temperature in the crisis of pneumonia is always accompanied by a relaxed condition of the cutaneous vessels, often manifested by colligative sweating. This increased area furnished to the circulating blood relieves the right heart at once; the dam is cut, as it were, and the surging stream of blood that was burdening the right heart has spread out at a time when the natural powers are also coming to the rescue in beginning resolution of the infiltrated lungs. Dr. Smith would have us imitate this method of relief by medicinal agents. No medicine will dilate the arteries and promote transference of blood from them to the veins, for any length of time. "Artificial respiration, and ligaturing the extremities to prevent return of flow," can only act temporarily. The cool bath comes to our rescue here. Anyone who has observed how the surface of a patient with high temperature redden's under friction in a bath will at once appreciate that this is a physiological method of dilating the peripheral vessels, and, what is better, restoring the tone upon which a large part of the circulation depends. Moreover, the pulse is always slowed by it; the respiration is deepened and slowed also. We have, therefore, every indication in the treatment of pneumonia fully met by the properly adapted bath, viz.:

1. To reduce the temperature.
2. To tone up the action of the heart.
3. To refresh the failing nerve supply of the heart and lungs.
4. To deepen the respiration.
5. To enlarge the surface of the blood.
6. To restore the lost tone of the capillaries.

Thus we have a physiological weapon against pneumonia, which has proved itself of marvelous power at the bed-side, as is testified by the personal observations of the writer and by the conclusions reached by Prof. Penzoldt (*Münch. Med. Wochenschr.*, 1890, No. 36). In a careful analysis of 2,200 cases treated from 1867 to 1889 in the Poliklinik of Erlangen, he says: "The results show that antipyretics do no real damage in pneumonia, but that, carefully applied, they are useful. The reduction of temperature is not to be regarded as the sole factor. If the indication is to improve the respiration, circulation, and cerebral activity, and to further expectoration, preference should always be given to a cautious bath-treatment. If the latter is not possible, or if, besides, a calming effect upon the subjective condition of the patient is desirable, a cautious use of the modern antipyretics is permissible."

Fismer (*Archiv f. Klin. Med.*, 1873, p. 443) gives, as comparative results in 220 cases treated with baths and the same number without baths, at Basel, a reduction of mortality of 9.6 per cent. in favor of the former, although they were more severe cases.

Prof. Baginsky, of Berlin, reports (*Archiv für Kinderheilk.*, B. 13, 1891) thirty cases of croupous pneumonia in children, characterized by high fever up to 106° . Twenty-four were entirely cured, two were convalescing, and four, suffering from complications (pleuritis, tuberculosis), were improving. Baginsky prefers a mild and careful antipyresis, together with tonics and stimulants, and regards cold water as less likely to produce the dangerous effects of chemical agents. He justly claims that, as the nervous system of the child is more impressionable, low temperatures should be avoided, especially as its cutaneous surface is more extensive and the surface vessels more abundant in proportion than in the adult. Cold baths, from 86° to 76° , are useful, but the cold pack is to be preferred. It is more convenient, it disturbs and alarms less, and has a vivifying effect upon the nervous system, while its curative effect in proper cases is undoubted. Baginsky applies the packs by wrapping the entire body except the face in sheets wrung more or less out of water from 58° to 72° , and covering with a blanket. In ten minutes this is repeated, and again once or twice later; the child may remain in the last (see p. 31). These packs may be repeated two or three times a day and preceded by stimulants. If they do not reduce the temperature considerably, the prognosis may be regarded as more serious. Baginsky does not resort to cold applications except when the temperature is very high, or nervous or adynamic

symptoms are manifested by moderately high temperatures. He occasionally administers medicinal antipyretics in conjunction in protracted cases of pneumonia, just as he does in other febrile diseases.

This recent confirmation of the value of hydriatic measures in this disease is valuable, coming from one of the foremost paediatric authorities of the day.

It is needless to multiply clinical testimony, when the rationale of the bath treatment is in accord with accepted views. When the baths are insurmountably inconvenient to patient and attendants, it is my custom to alternate them with medicinal antipyretics, carefully preceded by stimulants. Especially if the pulse is rapid and feeble, the baths should be preferred; they should be of shorter duration and more frequently applied.

THE ERUPTIVE FEVERS.

These, for the sake of brevity, are grouped together.

The method of applying hydriatic measures differs according to the stage of the disease and condition of the patient. Unless the temperature is above 104° , no bath under 85° should be used. If the patient is restless, a tepid bath is extremely useful, especially if it can be prolonged for half an hour without exciting the patient too much. When, in the beginning of the disease, there is a rapid rising temperature, with mottled skin, or a tardy appearance of

the eruption, with a rapid pulse, cyanotic nails, or convulsions, there is no measure that affords such positive relief to the nervous system which is overcome by the toxæmia as a cold affusion or dip-bath. Held naked in a tub containing twelve or fifteen inches of water at 100° , several buckets or pitchers of water at 75° to 80° are thrown over the head and shoulders; the body is then well rubbed and patient put to bed. The result is usually at once apparent in an improvement of all symptoms. As the relief may be of short duration, the treatment should be repeated every two or three hours, if necessary. The rationale of this treatment is explained on page 12.

When the temperature is high, pulse rapid, and pulmonary complications are threatening, we have in the graduated bath, 90° to 70° , for ten to fifteen minutes, with friction, an invaluable remedy which, once judiciously tried, will give the attendant and friends sufficient confidence to overcome the invariable objections of the patient. It should be repeated every three hours, if the temperature indicates it. The bath may be of shorter duration and repeated more frequently. The rule is, in case of collapse, adynamic or nervous symptoms, to use cold affusions or a dip (not over 70° F.) quickly applied; for high temperatures, etc., longer baths at 70° to 90° , with gentle friction, or the wet pack.

The following account of Dr. Reimer is the result of so large experience that it is here cited in

full from the Archives of Pædiatrics, 1890. Basing his statements upon a large number of thermometric tracings, Reimer divides scarlatina into the following forms:

	Per cent. of Mortality.
1. Simple or uncomplicated scarlatina.	
a. Mild	0.0
b. Severe.....	83.76
2. Complicated.	
a. Short, mild.....	2.08
b. Short, severe	6.94
c. Long, benign.....	5.66
d. Malignant.....	39.34
e. Prolonged, benign	26.47
f. Malignant.....	79.99
3. Scarlatina following other diseases.....	81.96
4. Scarlatina followed by other diseases.....	44.32

In the treatment of 3,460 cases of the disease, 978 were subjected to hydrotherapy, which was used with the idea of reducing the temperature in the following forms: (1) Cold compresses; (2) cold envelopment; (3) cold envelopment with dry friction; (4) cold affusions of water in the empty tub; (5) cold affusions in a half-bath progressively cooled; (6) short or long tepid baths; (7) full baths, gradually cooled; (8) cold half and full baths with friction. Cold compresses upon the head, thorax, and abdomen were frequently used, except in cases in which the restlessness of the patient was so great as to make its use too difficult. Their action was favorable upon

the heart, but they did not lower the temperature to any great extent. Cold envelopment was used especially in nervous, anæmic, or rachitic children. There was a favorable action upon the heart, but hardly any effect upon the temperature. Cold envelopment, combined with dry friction, was used in cases in which it was desired to produce cutaneous revulsion and excite the nervous system. Under their influence the respiratory movements became more regular, but the temperature showed no change. Cold envelopment, combined with affusions of water in the empty tub, the temperature of the water being 54° to 57° F., was tried in cases of cyanosis, stupor, and collapse. This treatment, used with all proper precautions, generally gave good results, but there was no effect upon the temperature. Results quite as favorable were obtained with cold envelopment, followed by affusions in a gradually cooled bath. In some of these cases the phenomena of collapse were notably aggravated, hence this method calls for unusual precaution in its use. The effect of prolonged tepid baths was bad. The temperature was uninfluenced, and a general weakness resulted, which in some cases was of a threatening character. The same was true in all cases in which a gradually cooled bath was used. Such baths have a sedative effect in typhoid fever, but in scarlatina their effect is pernicious. The efficiency of full cold baths in scarlatina was undoubted, if they were used methodically and with

proper precautions. The patient is plunged into a tub half-filled with water at a temperature of 54° to 57° F. After removing him from the water, he must be rubbed briskly and then wrapped in a woolen blanket. In such cases the temperature will frequently drop several degrees. The patients seem much relieved by such bathing, and will desire its repetition. It is impossible to give general rules for the use of hydrotherapy in scarlatina; the indications will vary with the progress of the disease. With regard to the treatment of the disease by the use of antithermic remedies internally, the author did not obtain favorable results with quinine, salicylate of soda, kairin, thallin, etc. On the other hand, the antithermic action of antipyrin never failed, but its use should be attended with the greatest care on account of the danger of collapse.

Dr. Hiram Corson, of Pennsylvania, a practitioner of high standing, furnishes, in the Journal of Balneology for March, 1892, some clinical testimony on the use of cold in eruptive fevers. He concludes thus:

“Rarely has anyone made a more careful trial of any remedy than I have made of this, in a practice of fifty-nine years, under the daily watch of intelligent physicians, anxious, no doubt, for my success, but doubtful of the propriety of my practice, and too timid to resort to measures to them so heroic.

“And now, in closing my career as a practitioner,

and looking back on the countless fights had with death in hovel and in palace, I can truthfully declare that no means ever used by me, or which have ever been known to me as used by others, in scarlet fever, have so successfully warded off its blows and shielded patients from harm and restored them to health as the use of cold water and ice."

In the same number Dr. Fodor, of Vienna, states that hydrotherapy is superior to all other methods of treating measles. He recommends washing of the entire body with cool water; this is done in bed by placing a waterproof sheet under the patient. The result is a slight reduction of bodily temperature, and stimulation of the heart action, nervous system, and digestive organs.

Dr. Alexander Goldstein reports, from the Buda-Pesth epidemic in 1891, 231 cases of *scarlatina*, in which cold baths were chiefly used. He says: "Antipyretics were avoided, because innumerable cases have convinced us that the seriousness of the disease does not lie in the high fever, although it cannot be denied that its prolonged continuance damages the heart, as well as the nervous system. Something must be done, therefore, to arrest it. Chemical antipyretics acted badly on the system outside of temperature reduction; cold and cool baths, on the contrary, whose happy effect we had learned to appreciate in last year's epidemic, acted excellently in this *scarlatina* epidemic. A tub, half-filled with water at 86°-104°, was

placed alongside the bed, and the patient rubbed in it for two or three minutes. He received about one-half to one ounce cognac, and the water was cooled down to 71° - 82° F by pieces of ice, which, being moved back and forth, threw waves upon the chest and back of the patient. The good effect was not only in the lowering of the temperature, but also in improving the respiration, innervation, and cutaneous action. The patient, who was unconscious before the bath, became less apathetic, etc."

SMALLPOX.

Hebra's treatment of this disease by prolonged tepid baths is valuable (*Intern. Klin. Rundschau*, No. 89, 1890). Not only may disfigurement be prevented by baths, but also the danger from purulent absorption be diminished. The greater the eruption and the higher the fever, the longer you must leave him in the water. These prolonged baths remove pus, macerate the vesicles, and further suppuration. Our best effort is toward removing the pus, and the best method for softening the pustules is to macerate them by prolonged baths, which open them also. If the case is severe, a continuous bath is needed, in which the pustules might be readily opened with scissors. After a bath of one or two hours, the patient should be removed and powdered with 10 grains of salicylic acid and 50 parts each of talcum and starch. He should then be wrapped in wet linen cloths and covered with blankets.

The powder is washed off with green soap in the next bath.

ACUTE ARTICULAR RHEUMATISM.

In the ordinary type of the malady we have in the pure salicylic acid the most valuable remedy. In the author's experience the local as well as general effect of this remedy is greatly enhanced by compresses wrung not quite out of water at 50° to 60° , wrapped around the painful parts and covered with flannel. It is those dangerous cases, however, regarded as *rheumatic hyperpyrexia*, in which more energetic treatment is indicated. Whenever the temperature rises above 105° , despite the salicylate treatment, the brain is threatened and danger is imminent. Ten years ago a committee of the Clinical Society of London made an exhaustive inquiry into this subject (see paper by Dr. H. C. Male, Practitioner, 1891), and in their report they show the necessity of not allowing the temperature to exceed 105° . Thus, in six out of eleven cases (unbathed) the temperature did not reach 106° , and they have shown that the treatment by cold is more successful the earlier it is commenced. Moreover, the temperature may rapidly rise when once it begins. In a case mentioned by Fox, the temperature ran up from the ordinary to 109° in two hours.

There are practically two methods of applying cold, says Dr. Male. The patient is lowered in a sheet into water of 90° to 100° F., cooled down by adding cold water, or preferably pieces of ice, till it is

reduced to 60° or 70° . He should remain in the bath till the thermometer, placed in the rectum, has fallen to 101° — 102° , unless faintness occurs.

The cold pack is applied in the following way: The patient remains in bed. He is stripped of all clothing, and a mackintosh placed under him. Towels are wrung out of iced water and applied to the trunk, head, and limbs. These are changed frequently, and the body sponged over with lumps of ice. An ice-bag should also be applied along the whole length of the spine. The temperature must be carefully watched as before, and the pack discontinued when the reduction has been effected.

Wilson Fox collected a series of twenty-two cases from 1867 to 1871, temperature ranging between 106° and 111.7° . Eighteen were treated by ordinary means, without the application of cold, and all were fatal. The remaining four were treated by the cold bath, and three of them were successful, the highest temperature being 110° .

The committee of the Clinical Society of London collected a series of sixty-seven cases during the ten years ending 1879. In thirty-nine of these the temperature exceeded 106° , and in thirty-four the treatment by cold bathing was adopted and fourteen recovered, the highest temperature being 109° to 110° . Of the more moderate temperatures among these (viz., between 106° and 107°), eight out of eleven

cases recovered—over two-thirds. All the cases that were unbathed died.

In the ten years ending 1890 many cases of recovery have been reported from time to time in the journals. Dr. Male has been able to find a record of sixteen cases with thirteen recoveries, temperatures ranging from 106° to 110.4° . The pack was used in eight of these, with two deaths, and the bath in the remaining eight, with one death. There is, therefore, ample evidence of frequent recovery after extreme temperatures, which under other conditions must certainly have been fatal. While, however, recognizing the success that often follows the employment of cold in rheumatic pyrexia, we must ascertain if there are any dangers attending its use.

Bristowe records a case where the cold bath on two occasions produced such serious faintness after five minutes' immersion that it had to be discontinued. At Guy's Hospital, from 1874 to 1877, death took place on two occasions during immersion; but in these cases the bath was probably too long delayed, and the heart and tissues had suffered too much from the excessive heat to withstand the shock. In several cases violent purging has resulted after immersion.

The following case is reported by Dr. H. C. Male: A. H., age 32; had been ill with rheumatic fever for six weeks, when he became delirious, flushed, and wild-looking; partly conscious, with high pulse and rapid breathing; temperature, 110° in axilla. As

is usual in such circumstances, pain and swelling had left his joints, and he could move freely in bed. Sweating had entirely ceased. He was at once put into a sheet wrung out of iced water, and his body was well rubbed over with ice. During the first ten minutes his temperature fell to 107.6° (rectum). In half an hour it fell to 103° , and the pack was discontinued, as it caused discomfort. He was rubbed dry and lightly covered with blankets. Patient now seemed quite himself. Delirium had ceased, and his condition was in every way improved. Quinine, 5 grains, was given every hour (larger doses were vomited). During the afternoon, temperature again rose above 104° . Pack was repeated, and temperature reduced to 101° , with immediate relief of symptoms (duration of pack not recorded). The patient died Nov. 4th. There is little doubt the patient's life was lengthened for some days.

IMPROPER METHODS.

This case is interesting as showing the powerful effect of hydriatic treatment, and illustrating an improper method of applying it. To place a patient into a sheet wrung out of ice-water, and to rub the body well with ice, will appear to the reader who has carefully studied the rationale of cold bathing in these pages as contrary to physiological ideas. The principal vessels were contracted, the blood was driven to the interior of the body, and "shivering and discom-

fort" were thus produced. If the sheet baths had been adopted, as described in these pages, with friction to dilate the peripheral vessels and enable them to carry the cooled blood to the brain, the effect would have been different. It may be claimed that the reduction of temperature testifies to the efficiency of the method. As the temperature was taken in the axilla, this was an utterly fallacious test, as I have shown.

The author has recorded a case of hyperpyrexia in rheumatism in the Transactions of the South Carolina Medical Association for 1873, in which a temperature of 106° was reduced by the cold bath and ice to the joints. This record testifies to the length of time he has devoted to the clinical application and study of the remedial use of water.

Reference to previous procedures shows the error many well intentioned physicians fall into in the use of water. It has been there shown that ice-water is not an antithermic application. Indeed, the prolonged tepid bath is really the most efficient antithermic bath known. In a case of hyperpyrexia the latter would be more applicable than in cases of severe adynamia, in which iced water is more useful.

CHRONIC GOUT AND RHEUMATISM.

We have in these diseases the manifestations of a vicious mode of life or of exposure to other deleterious influences, combined or not with inherited ten-

dencies, which but too often play an important rôle in etiology. We must address our treatment in both to improving the digestion and assimilation of food, increasing elimination of effete products, and, by supporting the strength, enhancing the patient's powers of resistance. The utter futility of medicinal treatment for these purposes is evidenced by the multiplicity of remedies which have accumulated in our books upon the subject. To accomplish any valuable result in such a malady, to rearrange, as it were, the entire nutritive system, to divert it from its vicious tendencies, to remove products of retrograde tissue metamorphosis and to prevent their reproduction, experience has shown may best be done by physiological agencies, as diet, exercise, and certain hydriatic measures.

It is my custom to give these patients a diet containing the smallest possible quantity of nitrogenous material. Red meats are forbidden; also the white of eggs, fermented liquors—indeed all foods or drinks which tend to increase the production of urea and uric acid. So long as the best clinicians are unable to agree upon the true pathology of these diseases and the best diet for them, a nutritious, medium diet, like the above, has seemed to me to be the most valuable.

As Prof. Semmola has shown, there is no method of treatment which has given such remarkable results in these disturbances of tissue change as judicious

diet and exercise, combined with hydrotherapy. Massage in the more painful stages, and passive exercise in the subacute conditions, are indicated. Most observers are agreed upon this point. When the muscles are placed in action, the lymph and blood-vessels are compelled to do their work, absorption takes place, and the general activity of the system thus evolved must aid materially in the removal of fluid deposits. The judicious prescription and equally judicious observance of gentle muscular exercise form an important element in the treatment of gout and rheumatism. This exercise, however, must be avoided as long as redness and local swelling are combined with pain.

A powerful auxiliary to judicious diet and exercise may be found in the application of certain hydriatic procedures. It will be found useful to distinguish, in this connection, between the several types of gout and rheumatism which come under observation:

1. The anæmic type, rendered so by long continuance of the disease and consequent abstention from exercise, by loss of sleep, etc.
2. The plethoric form, usually, though not altogether, found among the better situated.
3. The intermediate form between these.

In the first type, a tonic procedure being indicated, we have in the gentle and judicious application of cold water our most valuable remedy. The skin should be educated, as was described in the treatment

of phthisis, first by the dry pack and subsequent cold ablutions, then by the dripping sheet and rain bath. In the third (intermediate) type the same course may be pursued. In these cases we have in the wet pack (*i. e.*, patients are wrapped in sheets wrung out of cold water, and covered with blankets like a mummy, to be followed in an hour by the half-bath at 70° to 65°) a valuable means, not only of promoting tissue change, but of relieving debility, improving the appetite, and building up the nerve tone.

The second type (plethoric), in which there is so much stiffness in joints and muscles, without general failure of health, is more difficult to manage. The resolvent method is the most useful. In these cases I have found the hot-air bath, followed by the douche, most applicable. And here let me say a word of warning against the indiscriminate use of the Turkish bath. Being applied by ignorant attendants, the patient is subjected to treatment which may do him much damage. What is luxury and comfort for the healthy is certainly not always best for the sick. The heating of the body in dry blankets for several hours, while the patient is made to partake freely of cold water (preferably alkaline), is a method by which Priessnitz has obtained remarkable, almost marvelous, results, as we are informed by reliable observers living to-day—for instance, Prof. Semmola, of Naples.

The box hot-air bath, followed by the cold bath, is, after educating the patient's skin, a most valuable

measure. It has been demonstrated that, aside from the beneficent effect upon tissue metamorphosis in the gouty and rheumatic, the increased energy and power of resistance of the cutaneous nerves against atmospheric influences is not to be underestimated. Colds must become more rare, and these are not only often the chief causative factor, but, especially in rheumatism, they form by their frequent repetition the basis of the entire disadvantageous tissue change.

The following clinical history from Duval (p. 553) illustrates the value of methodical treatment, even in desperate cases. It is of the third type mentioned above:

Z., a Pole, 65 years old, well developed, of bilio-sanguine temperament, high color, was sent to me by my friend, Dr. Raciborski. Patient had suffered greatly from the political misfortunes of his country, having lost his fortune, which completely changed his mode of life, so that he was compelled to work as an engineer. He was subject to frequent attacks of gout, for which he had all kinds of treatment. When, on December 12th, he applied to me, he presented nodosities on most of his fingers and metatarso-phalangeal articulations. Every week he had grievous attacks, lasting two to four days. He had no heart trouble, and no loss of sleep or appetite. Morning and evening he had a rain bath of five seconds, followed by a jet douche of a minute, played all over the affected articulations. On the 16th he had a severe

attack; he was placed in the hot-air box, with wet compresses on head and feet; and when the skin became warm he received several drinks of cold water every five to ten minutes. He perspired freely in twenty-five minutes, and was then placed into a rain douche for fifteen seconds, followed by a jet douche as above. He was well rubbed with warm, dry cloths, and was now able to walk, which he had not been able to do in two years so soon after the attack. The douches were renewed every day, the hot-air bath every two days. The paroxysms returned, but with less severity. On the 24th, one commenced which was completely aborted. Treatment was continued, but he had three more approaches to attacks in ten days. From Jan. 15th he had the hot-air bath every day. He left on Feb. 12th, after having been entirely well for over a month. We have seen him time and again since, but he has remained well.

CHRONIC RHEUMATISM.

The following histories are furnished from the Montefiore Home by Dr. Max Rosenthal, late resident physician:

Case 1.—B. V., 54 years old; eight or nine years ago suddenly developed swelling at the elbow, which was very painful; same night affected in the left knee; spread to left elbow and wrist, then to right knee and ankle and toes. He was transferred in ambulance to Bellevue Hospital. After five or six days returned

home. It took some weeks to obtain complete cure.. After an interval of six months, the disease recurred. and lasted about three weeks. He had repeated attacks at shorter intervals up to two years ago. For two years he had swellings, with pain and stiffness in feet, knees, fingers, and wrists. Went to Mt. Sinai Hospital for gout, and received medicated compresses; later received salicylic acid and potassium iodide. He learned to walk with crutches; received massage with pine-needle oil. The disease returned while in the hospital, where he remained three months; when he left he was able to move around on crutches. Could not attend to his work any more; took salicylic acid.

At the time of admission to the Home he complained of pain in the ankles on moving around. Toes and ankles were quite stiff, knees less so. Toes were extended; skin around both ankles cicatrized and mottled, of a dark-blue color. He walked with great difficulty on crutches. Treatment: Anti-rheumatic diet and wet compresses to swollen joints, changed hourly; hot general fomentations and general bath on alternate days.

Dec. 1, 1889: Wet pack on alternate days—sod. salicyl., gr. xv, t.i.d.; much better; walks around with greater ease.

Dec. 11th: Developed acute laryngitis.

Jan. 31st: Feels much better; says he feels lighter.

Feb. 15th: Has had hot-air box and Scotch douches on knees and ankles, followed by rain bath at 70°. Improvement continues under this treatment. He now can walk for hours without crutches; pain entirely gone. His recovery was complete. A few days prior to his contemplated discharge from the Home he was attacked by peritonitis from a perforation in the appendix, to which he succumbed.

Case 2.—S. Z., 26 years; single; Austrian; waiter; admitted November 14, 1889.

Family history: Father died at 45, twenty-one years ago, of phthisis; mother is alive and well; five brothers and two sisters living.

Personal history: Sick six months. Had measles and scarlatina as child; at 6 both legs run over; had typhoid fever about the same time; was a weakly, delicate child. At 14 had rheumatism with severe pains in the muscles, which were painful on movement; no fever; lasted about seven months; cured by baths. Went to work in hardware store at 17. Was thereafter disturbed by headache, dyspepsia; occasional winter cough, with expectoration—last absent for two years. Last July attacked by gonorrhœa; discharge light; treated by copaiba and injections. Two weeks after commencement of urethral trouble, noticed swelling at the root of toes of right foot, and painful right knee; employed the Russian bath as a curative measure. A week later, right ankle became painful and slightly swollen on its inner aspect. Di-

rectly after, attacked by a severe pain in the small of the back, with stiffness. Two weeks later, left elbow became quite painful, especially on pressure; pain would leave one foot and go to the other. Spent three days in August in the German Hospital. Went two weeks later to Mt. Sinai for twenty-four hours. Treated outside by some medicine which induced profuse sweating. At time of admission, presented swelling of right ankle, especially marked upon its inner aspect; also swelling of the eminences of the big and little toes, the latter very painful on pressure. The other foot was about the same, but less marked. Knees very painful, especially on extension. Standing was more painful than walking; gait was stiff and much impaired. Appetite was poor; bowels rather constipated; urine was high-colored. Gonorrhœa had stopped four months before admission. Sleep was poor; patient was very anæmic and badly nourished; urine, 1.022.

Treatment: Anti-rheumatic diet; ferr. oxid. sacch., 3 j, t. i. d.; hot fomentations and pack and half-bath on alternate days; cold compress to feet daily, changed six-hourly.

After admission, appetite improved materially; sleep poor; constipation continued. Rochelle salts, 3 j, in hot water, at 6.15 A. M. daily.

January 2, 1890: Patient is entirely cured of his rheumatism. Feels in excellent health; constipation

relieved; sleep still imperfect. Advised to stay a little longer to assure permanence in the obtained result.

Discharged cured.

These cases illustrate the value of a judicious systematic hydrotherapy in the most unpromising cases. Such cases are usually sent to distant hot springs and other resorts, with more or less benefit. To subject a patient, crippled by his painful joints, to long journeys and great pecuniary outlays, when far more efficient treatment may be had at home, is surely reprehensible. I have treated two cases of chronic rheumatism with favorable results, after they had determined to spend the winter at the Hot Springs of Arkansas. That a visit to mineral-spring resorts is often beneficial, chiefly by freedom from household or business care, and hygienic advantages, cannot be denied, but its effect is so often problematical that other more simple and less expensive and troublesome measures should first be resorted to. Such measures we have ample warrant in affirming we possess in the use of water judiciously adapted to each case.

I might furnish numerous histories from private and hospital practice to sustain this assertion. But they are all very much alike. There is a history of long suffering, stiffness and impeded locomotion, and general hopelessness, due to the failure of a multiplicity of remedies from doctors of high and low degree. They have rarely had systematic, prolonged treatment of any kind. Water especially has been

avoided. None of these cases should be regarded as hopeless until hydrotherapy and its auxiliaries have been *fairly* tried. While my personal experience and observations justify this positive assertion, I have intentionally omitted the recital of cases from private practice, preferring to illustrate by cases recorded in institutions, because one is more or less liable to be biased in the reporting of his own successful cases.

ANÆMIA AND CHLOROSIS.

Whether it be idiopathic or a manifestation of organic pathological processes, a faulty haematosis most frequently demands the attention of the physician. The patient and his friends are justly anxious when pallor, accompanied or not by emaciation, points with unerring finger to some serious defect in the system. The remedies usually applied with more or less energy are nutritious diet, exercise, change of scene, and iron. Months and years are sometimes spent, with more or less success, in the treatment of the failing haematosis. "Of what avail are a nutritious diet and iron if the appetite is feeble and the stomach incapacitated?" is a sad but frequent observation.

In mild cases of functional anæmia, due to over-work, inattention to sanitary conditions, insufficient food, or mental disturbance, the removal of the cause is the chief end of treatment. But this purpose may be powerfully aided by certain hydriatic procedures, whose effect has been demonstrated to improve the

force of the heart, deepen the respiration, and enhance tissue metabolism. That water of low temperature, rapidly and briefly applied under good atmospheric pressure, produces these effects, clinical observation has frequently demonstrated. In the able thesis of M. Thermes, read before the Société d'Hydrologie in 1878, he offered, as the result of careful examination with Hayem's hæmometer, the demonstration that the judicious application of cold to the periphery increased the number of red corpuscles and improved their quality. Winternitz states (*Path. u. Hydrotherapie der Phthise*, p. 26) that in numerous cases of chlorosis and anaemia he has demonstrated an improvement in the oxyhaemoglobin constituent of the blood by Fleischl's hæmometer.

The necessity of promoting and encouraging tissue change in all diseases in which there is a faulty haematosis, is obvious. Here I am able to furnish abundant testimony of the auxiliary value of hydrotherapy. Again and again I have observed cases of anaemia and chlorosis, which had defied prolonged iron treatment under my own care as well as under the advice of colleagues, yield readily when a suitable hydriatic method was added.

The most simple means for this purpose is the cold ablution, taken every morning while still warm from bed (but not alternating with warm bathing), not with a wash-rag, however, but by pouring water at 70° abundantly from a sponge or pitcher upon

successive parts of the patient, who stands in a little hot water to prevent chilling. Gradually we may advance to the dripping sheet and wet pack.

Several years ago Dr. Mary Putnam Jacobi wrote an able essay on the wet pack and massage in anæmia, in which she furnished so exhaustive a description of the method and physiological action of the treatment that I refer to the original for valuable data. Suffice it to state that *in no type of disease does the water treatment evince more brilliant effects than in anæmia and chlorosis.* The most valuable method in my hands has been the rain bath of 90°, reduced to 80°, and followed by the spray or jet douche of five to ten seconds at 50° to 70°, the temperature of the water being lowered one degree every day.

That the presence of organic diseases does not preclude the application of hydrotherapy, has been amply demonstrated by its effective application in cardiac, renal, hepatic, uterine, and nervous diseases. Whatever tends to elevate the general tone of the system, to stimulate the appetite, heighten the nutrition, give sleep, and refresh the system, is of value in cases of organic disease. We have ample warrant for asserting that the cautious application of water has no equal in these therapeutic qualities.

The effect of these procedures may be greatly enhanced by the hot-air bath of sufficient duration to fill the cutaneous vessels. An occasional hot-air bath, brought to the point of free perspiration, is of value

in the promotion of tissue change. Indeed, Sholz, of Bremen, has reported some remarkable results from this feeble depletion of chlorotic patients, followed by tonic procedures.

13 FEF

CHAPTER VIII.

PHTHISIS.

Phthisis is a disease in which we have a serious and destructive local manifestation due to a general infection. Realizing this fact, its most modern management has become exceedingly simple, and more successful in proportion to its simplicity. Methodical treatment under conditions which afford the patient the best opportunity for outdoor life, in air that is free from dust and other vicious elements, has proved in the hands of Dettweiler and Brehmer, and others, so efficacious that we may look forward to a much more hopeful prognosis in the future. *Phthisis has now become one of the curable diseases.*

The most important indication is to endow the system with power of resisting the inroads of the established disease, and to treat complications and sequelæ. This may be met by residence in an appropriate climate, by proper and carefully regulated exercise, diet, and hygiene, by certain medicinal agents, and last, but not least, by a judicious hydro-therapy.

With regard to exercise, the plan adopted by Dettweiler and Brehmer of exposing patients to the constant influence of pure air and sunshine, without the possibility of chilling them, is the most useful, and may be accomplished in private practice also, as I shall show.

The lungs should be treated as is every other inflamed organ. So long as active inflammation exists, they should be kept at rest, or slowly and gently expanded. The *presence of fever precludes outdoor exercise.* Simple outdoor life must then be substituted, with massage or passive movements to stimulate the muscular system. Much of the ill-effect of absolute quiescence will be counteracted by hydrotherapy, if properly applied.

In this measure we possess an agent whose power for good is incalculable, and which has given me more valuable assistance than all other means combined. The judicious application of cold or cool water to the periphery produces a stimulus to the sensory nerves which is transmitted to the central nervous system, and thus *refreshes every function dependent upon the latter.*

The respiration is gently but slowly deepened whenever the cold water impinges upon the skin. The heart is made to contract with more vigor when the peripheral circulation is improved by the shock, and consequent contraction and subsequent dilatation of the cutaneous capillaries takes place. The appetite is improved, tissue change increases, and, if there is a rise of temperature, it is subdued mildly but surely.

Solkowsky reported in the *Bulletin de Thérapie* for 1877, 106 cases of phthisis; 60 in the first stage, 29 marked, 17 advanced. After six months' treatment by the cold douche, 39 were cured, 34 improved, 19 improving, 7 without result.

The value of hydrotherapy in phthisis has been recognized by Brehmer, who even claimed to be the first one to apply it in this disease. Winternitz has shown that it must be an agent of decided tonic power, inasmuch as out of 2,400 guests at his institute in Kaltenleutgeben, which I have personally visited, 56 per cent. showed an increase of weight. *As nutrition is the chief aim in phthisis*, we possess in hydrotherapy a powerful weapon which, rightly used, will surely demonstrate its value.

But, aside from this important consideration, the predisposition to repeated colds and consequent probable aggravation of the local processes and general symptoms may be diminished by the neuro-vascular discipline to which the skin is daily subjected by appropriate baths. This hardening process has long been recommended for those predisposed to phthisis. Ziemssen speaks of it in his lectures on the treatment of tuberculosis as "*a remedy of extraordinary value* for persons who are predisposed to, or have acquired, phthisis."

The technique of the procedure in this disease varies with each case. Brief applications of low temperature, as by douche or rain bath, the wet pack, or rapid ablutions, are followed by rapid reactions, and, if well borne, are exceedingly useful as tonics; while, on the contrary, in cases suffering from elevated temperature and great debility, more gentle procedures and higher temperatures are required. I have myself

seen damage done to these cases by too cold applications, which are better indicated in a febrile or mildly febrile condition. This is contrary to views usually entertained on the therapeutic action of cold baths. My observations at the Montefiore Home for Incurables, in which cases of the most forlorn type, so far as previous hygienic surroundings are concerned, are received, have led me to adopt the following course, because the skins of many of these poor people have long been strangers to cold water, or, indeed, water of any kind. After a thorough cleansing with a warm bath or soap ablution, a day is allowed to elapse. The patient is now wrapped snugly, quite naked, in a woolen blanket, so that his entire body is excluded from air; other blankets are piled over him; the windows are opened, and he is given a small glass of iced water every ten minutes. Having lain in this position an hour, a part of the body is exposed and bathed as follows: A basin of water at 75° is made ready, into which the attendant dips his right hand, covered by a mitten or glove of Turkish toweling. With the wet glove the face is well bathed. Now one arm is exposed and rapidly washed and rubbed, then dried and replaced under the blanket. Other parts are then successively treated. At the termination of this ablution the patient is rapidly rubbed all over with a coarse towel. This treatment is repeated daily, the temperature of the water being reduced two degrees on each occasion.

The next step is the dripping sheet (see page 21). This method requires great care and skillful application. Its success or failure depends upon ascertaining by previous treatment the reactive capacity of the patient.

The most useful hydriatic procedure in phthisis, however, is the rain bath (see page 70). Unfortunately, this "finely-divided douche" can only be administered in institutions. The water should have a fall of not less than forty feet. The temperature adapted to the average case of phthisis is 70° . It should be higher (90°) in the beginning, and gradually decreased. Its duration should be brief, not exceeding a minute. The advantage over other baths lies in the pressure with which the water strikes the body, affording a kind of massage, which assists in producing reaction even in feeble individuals. But it should not be applied without previous training of the skin, as above described. The rain bath is an antipyretic of great value, if its temperature is not below 65° nor above 75° ; it is a stimulant and tonic if between 60° and 70° F. The skin should become pink while under it, and the patient must not be chilled by it; at least, any coldness he may experience should disappear after he is dried. This, indeed, is a test of the efficiency of all hydriatic procedures. Decided chilliness, continuing after thorough drying and friction, is an evidence of improper selection of the temperature, duration, or method of the bath. These should be modified as indicated by their effects.

The hot air box bath offers an excellent substitute for the more tedious dry pack above described. It quickly brings the blood to the surface, and thus enhances reactive capacity of feeble patients. Care should be taken, however, that the patients do not perspire in the hot-air bath. I have seen this error prove serious by destroying the patient's reaction and enfeebling him.

The following cases, taken from the records of the Montefiore Home, by Dr. M. Rosenthal, the senior resident physician, may serve as an illustration of the clinical results of this treatment:

J. J., tailor, aet. 33; German; admitted February 2, 1890. Family history negative. Illness of one and one-half years' duration. Began with pulmonary haemorrhage, followed by cough; spat blood two days, and felt better after it. Continued to cough until December, 1889, when he had a most severe haemorrhage, became very weak, and was confined to bed.

Continues weak; cannot work; coughs a great deal; expectorates a little mucus, often mixed with blood. Complains of pains in back, tickling in larynx; appetite is good, bowels regular.

Physical signs: Dullness over right upper lobe, as far as first rib, posteriorly to border of scapula; slight dullness over left apex; uncertain and accentuated breathings, with prolonged expiration over right apex, feeble respiration over left. Temperature, normal; pulse, 84; respiration, 28.

February 18th: Weight, 135 pounds. Treatment, one-minim creasote pill, two t. i. d., with cod-liver oil 3 ss. Rain bath at 65° for thirty seconds daily.

March 1st: Coughs only a little in the morning. Weight, 142½.

March 20th: In fair condition; quite a little cough in the morning. Weight, 149½.

April 25th: Weight, 161½.

May 5th: In the last few days appetite is not so good; otherwise feels very comfortable. Coughs sometimes in the morning; no expectoration. Weight, 160½.

Dr. Dessau examined patient to-day. He found very slight broncho-vesicular respiration in the left apex. Impaired resonance on percussion of the same, and very few mucous râles. On the left below the scapula very few subcrepitant râles, probably due to old pleuritic adhesions.

May 11th: Right apex, vesicular respiration and very slightly impaired resonance, which is often found normally in right chest, so that practically we can find now only a very slight infiltration of left apex, with some old pleuritic adhesions. Weight, 161 (a gain of 26 pounds). Discharged at his own request.—He has been at work since that time.

J. D., aged 36 years; ill two years and a half. Had haemorrhage two years ago, since then night sweats, cough, expectoration, and pain in left side. Has been treated twice at Mount Sinai Hospital for phthisis.

Physical signs: On admission, dullness over left apex, impaired breathing; pleuritic friction râles on right side along axillary space. Weight, 162½ pounds.

Treatment: General sustaining measures, with daily rain bath at 65° for thirty seconds; damp compresses to chest.

Result: Improvement of all symptoms, and gain of 1½ pounds during ten weeks.

From Dec. 16, 1890, he was subjected to tuberculin treatment until April 29th, other treatment being suspended.

The patient now lost so much in weight and general appearance that I frequently felt misgivings as to the propriety of subjecting him to the experiment. The rain baths were resumed, and his general condition at once improved and appetite returned.

At the present time there is no cough, the least amount of expectoration, and but few pleuritic friction sounds over left apex. His weight is 178½ pounds. Dr. Hodenpyl, who kindly examined all sputa, reported: First examination, about 10 bacilli to the field: second examination, very few bacilli; third, fourth, and fifth examinations, no bacilli.

This patient may be regarded as recovered, judging from physical signs, subjective symptoms, his general condition, and the absence of bacilli.

H. S., aged 31; admitted May 2, 1890. Family history negative. Always well until May, 1889, when he had first pulmonary haemorrhage; was confined to

bed eight weeks with cough, night sweats, and afternoon fevers. In September, 1889, and January, 1890, he had haemorrhages, and went to Mount Sinai Hospital, whence he was discharged improved in seven weeks. He had cough, expectoration, and pain in the chest; no appetite when admitted.

Physical examination: Dullness over right third anteriorly and posteriorly; subcrepitant and friction râles; broncho-vesicular respiration, with prolonged expiration. On left side, prolonged expiration, with some friction sounds over left apex. Weight, $129\frac{3}{4}$ pounds.

August, 1890: Sputum found to contain bacilli.

In September, 1890, he had a haemorrhage. During this time he received rain baths, syrup of hypophosphites and creasote; at times cod-liver oil. Under this treatment he steadily improved, so that when he was subjected to tuberculin injections, on December 6, 1890, he weighed 146 pounds—a gain of $16\frac{1}{4}$ pounds in six months and a half—and no bacilli were found by Dr. Hodenpyl in his sputum.

There were still, however, dullness over right apex, broncho-vesicular respiration, and subcrepitant râles. His temperature was 99° . April 15th, tuberculin injections discontinued.

There being no tubercle bacilli in the sputum and no cough or expectoration, and the physiological signs being only a slight, jerky respiration, he was discharged as cured, April 29th, weighing $149\frac{1}{2}$. He

has therefore increased 20 pounds since his admission, and 3½ pounds since injections were begun, during the continuance of which he lost very considerably. He went to work at Bronxville, N. Y.

A. V., a nurse in the Montefiore Home, weighed, in summer of 1890, 138 pounds. She was constantly engaged in the wards, in which her mother was also a nurse. She began to lose flesh while at work; cough and expectoration were pronounced, and she had two small haemorrhages.

Physical examination reveals impaired resonance over left apex, jerky, exaggerated respiration, fine moist and pleuritic râles. Bacilli abundant in the sputum. Weight, 126 pounds on January 5th, when she was subjected to tuberculin injections.

She received twenty-one injections, progressively increased. They were always followed by decided febrile reaction. The last injection of 45 milligrammes was administered on the 1st of April, and was followed by very slight reaction. During the entire treatment she had daily rain baths.

April 10th: Cough, expectoration, night sweats, and physical signs have ceased, her weight increased to 132 pounds, and, no bacilli being found in the sputum, she was discharged at her own request as cured. She is now working as a private nurse, feeling perfectly well.

In these cases the effect of the tuberculin was either deleterious or negative, while that of the rain bath was excellent.

The following case is cited to illustrate the tonic effect of hydrotherapy in a desperate and advanced case of phthisis.

B. S., aged 18, architect; admitted Nov. 19, 1890. Mother died of chronic phthisis. Has been ill since he had an attack of pneumonia two years ago, with night sweats, troublesome cough, and loss of flesh.

Physical signs: Those of a cavity. Tympanitic dullness over the upper third of left lung anteriorly, cracked-pot sound, cavernous râles, tubercular breathing, signs of catarrh in right apex. Complains of palpitation greatly. Weight, 115 pounds. Bacilli numerous.

Treatment: Rain baths, 70° to 65° , thirty seconds; cod-liver oil and creasote.

December 16th: Up to this time his weight has increased eight pounds, although the physical signs are the same as on admission. Temperature normal.

He was now subjected to tuberculin treatment, under which he increased (as an exception to the rule), by April 10th, to 138 pounds. Cough does not trouble him now, and he expectorates very little. A few bacilli at every examination. Physical signs not so pronounced. Râles few, and there is evidence of contraction of cavity. The palpitations, which troubled him greatly, have disappeared.

Dr. Hodenpyl's report is interesting:

December 16th: One hundred tubercle bacilli to each cover-glass.

March 1st: Two bacilli to field.

May 7th: His weight is 139 pounds. He has been receiving rain baths since the injections were stopped. *He looks well*, and may be regarded as markedly improved.

He was discharged on July 14th, weighing 140 pounds, and looking the picture of health.

A case from private practice illustrates the air and water treatment, which has given me such satisfactory results that I would commend it despite the fact that it involves much trouble and demands much judgment:

Mr. H. M., aged 28, whose brother died of phthisis, was sent to Minnesota seven years ago by Dr. A. L. Loomis, with the diagnosis of incipient phthisis. He settled in St. Paul, married, and his health improved, so that he regarded himself as cured. Later he had sweats and fever.

January 9, 1891: I found infiltration in right apex as far as the second rib. The general signs indicated a more advanced lesion. His temperature ranged from 101° to 104° ; his cough was incessant, accompanied uniformly by blood-stained expectoration, containing bacilli abundantly; his appetite was nearly gone; sleep unsatisfactory, and accompanied by exhausting sweats. Altogether he presented the picture of a rapidly advancing process, although there was no evidence of breaking up. The weather was extremely severe, snow being frequent. Being ex-

hausted by the journey, he was allowed to rest a few days. The pure-air treatment was adopted. The patient was placed upon a steamer chair, wrapped in furs from head to foot, the face alone being exposed. All the windows, except one in the immediate vicinity, were opened. He remained in this position from one to four hours, daily increasing the time. The windows were closed at noon, when he was taken to his bedroom, which had been in the meantime thoroughly aired and warmed just before his return. He now received hydriatic treatment, after which he had luncheon, and was again placed in his steamer chair on the parlor floor. The bedroom windows, having a southern exposure, were again left open until he returned. When he was snugly in his bed, one window was left open from the top over night.

The remainder of the treatment consisted in an effort to endow the system with power to resist the inroads of the disease. He was gradually educated to bear water treatment during the first five days, as described. He then received the dripping sheet at 70° , with affusions at 65° , reducing both two degrees every third day until the former was 64° and the latter was 58° . He had abundance of milk, which he formerly loathed, and his appetite improved—eggs, strong farinaceous broths, and mushes. On March 14th he had so far improved that he had registered a normal temperature for two weeks, even in the evening; he was entirely free from cough and expectoration, ex-

cept early in the morning; there were no night sweats, and he slept soundly. The physical signs had improved, so that it required a very careful auscultation to discover them. Bacilli continued to appear, but in diminished numbers. *He had attained his normal weight, gaining twelve pounds in flesh.* I did not resist the importunities of the patient to allow him to return to St. Paul, inasmuch as he insisted that he was now in far better condition (feeling quite well) than he was when Dr. Loomis sent him there seven years ago.

The second chapter in this case is equally interesting. A few days after his return he rode in an open cable-car in inclement weather, contracting a cold which brought him to bed. Imperfect water treatment, which he obtained at home, probably contributed to this issue. Reports reached me that he was desperately ill, his physicians declaring it was useless to treat him any longer. Feeling that hydrotherapy had rescued him from desperate straits before, he determined to make the journey to New York. He arrived the latter part of April in a most forlorn condition. Examination revealed a catarrhal pneumonia, involving the entire lower half of the left lung, with evidences of softening anteriorly just under the nipple. His temperature ranged from 102° to 105° ; he had night sweats, severe cough and expectoration; no appetite. Nevertheless I subjected him to the same course as in the first instance—without any result, however. Wet packs, too, failed to reduce

his fever. He now entered the Montefiore Home for the purpose of more systematic treatment. Here the rain baths always reduced his temperature; otherwise he did not improve. He then was treated at home by my private nurse, but steadily failed. As a last resort, regarding the treatment at home as imperfect in some way, I had him brought to Long Branch, in order to have him under my personal supervision. The night sweats were now so exhausting that I gave him atropine, without effect. He was again subjected here to a systematic water and air treatment. He was ordered to lie in a hammock under the trees all day; he had wet packs and the dripping sheet under my personal direction. Improvement was marked, showing itself first in a normal morning temperature and better appetite.

In three weeks he was so much better that he committed the imprudence of walking a mile to the Iron Pier to receive his wife. This act came near being fatal to him. The local process was again lighted up. He was put to bed; linen compresses wrung out of water at 65° , and later out of 50° , were wrapped around his chest and covered by a flannel bandage, renewed every hour, renewal being preceded by an ablution of the chest with water at 70° . He had a general ablution morning and evening. Under this treatment of absolute rest, and without any medicine except a creasote mixture, he again improved, with the exception of a brief relapse caused by another imprudence.

The patient was seen by Drs. Andrew H. Smith, Birmingham, and Offenbach, at this time. To avoid the fall storms, he was sent to Dr. V. Ruck's Sanitarium in Asheville, N. C., in good condition. Here he held his own until he returned to St. Paul. In a letter dated March 16th he writes that he had gained $7\frac{1}{2}$ lbs., had forgotten the meaning of night sweats, appetite as good as ever; he has no fever, and coughs only a little in the morning. He is now (May, 1892) traveling for his house in Montana.

The cases here cited demonstrate the value of hydrotherapy in a disease in which formerly it would have been regarded as reprehensible, if not homicidal. It furnishes, therefore, a conspicuous illustration of the *use of water in modern medicine*.

CHAPTER IX.

DISEASES OF THE NERVOUS SYSTEM.

The application of water in the treatment of functional and organic diseases of the nervous system has long been established. Especially since these affections have become more frequent by the wear and tear of modern life has its value been attested by physicians in all countries. Charcot and Erb are representatives of the highest type of specialists in this class of disease. The former's constant reference of cases to the hydrotherapeutic establishments, in Paris and elsewhere, is well known. Indeed, the douche treatment has come to be synonymous with Charcot's method. Prof. Erb has, in Ziemssen's Cyclopaedia of Therapeutics, told us that "cool and cold baths in various forms belong to the most important therapeutically active agents in our field. Since this method has come to be more fully studied and more rationally applied, it has made notable progress. *Its results in all possible forms of chronic nerve troubles are extraordinarily favorable.*" This opinion from a man who has done so much for modern neurology must surely be an incentive to those who have never resorted to hydrotherapy to utilize it, and to those whose success has not been encouraging to investigate if there may not be some defect in their methods.

As has been frequently demonstrated in these pages, success is absolutely dependent in all cases upon a correct application of the principles underlying the water treatment. I have seen in the written directions given to a patient by an eminent neurologist the following: "Wrap yourself in a cold wet sheet every evening, and have yourself well rubbed with it." How can benefit be expected from such treatment? At the time these directions were written, the temperature of faucet water was 44° ; at the present writing it is 60° ; it will be 75° F. in the summer. Thus the patient would have a range of thirty degrees, and still be following the directions. A difference of thirty degrees, as every water nurse knows, produces an enormous difference of effect in the same patient. Moreover, if a patient requires a wet sheet of the temperature of 44° , its application at 75° would have a depressing effect. A gradual *decrease* of temperature would be far more rational. This incident is mentioned, however, to illustrate the looseness with which water is prescribed by otherwise well informed men and to impress the lesson that failure is as sure to attend a careless hydriatic prescription as a careless medicinal one. This chapter shall for this reason be devoted to the specifications of those hydriatic methods which have been found most useful in practice, rather than a theoretical and laudatory exposition of hydrotherapy in nervous diseases.

HYSTERIA.

This frequently obstinate and intractable malady has been the most fruitful field for hydrotherapy. In connection with other methods, such as isolation, diet, etc., the most valuable and unexpected results have been attained from water. In his "Clinical Lectures on Certain Nervous Diseases," translated by E. P. Hurd (G. S. Davis, 1888), Charcot says (p. 181): "In Paris for the last fifteen years hydrotherapeutic health institutes have treated such patients with complete success, possessing admirable arrangements for this end."

There exists a fallacy in the minds of many that, inasmuch as pouring cold water upon a poor girl who is writhing under a hysterical spasm or lies lifeless in a hysterical swoon often restores her, this heroic method may be indiscriminately applied to all cases of hysteria in and out of the paroxysmal stages. And some seem to picture Charcot's douches as the pouring of streams of cold water from a hose upon the trembling forms of these sufferers.

The real benefits to be derived from water in hysteria will be found in the assistance furnished by it in the building up the lost nerve tone, the improvement of appetite, digestion, and assimilation, and especially the resisting power of the nerve centres by transmission of the modifying effects from the peripheral nerves, which receive them from the impact of cold and cool water.

In connection with water treatment, two types of hysteria must be distinguished, the *erethetic* and the *depressed*. In the erethetic types low temperatures and active mechanical procedures should be avoided. The wet pack, so ably described by Dr. Putnam Jacobi, is the most useful procedure. Enveloping the patient daily in a sheet wrung out of water not below 60° or above 70° (see pages 24-27 for technique), and allowing him or her to lie in the pack, with open windows, for an hour or more, doubling the sheet if the procedure is to be prolonged, following this by a half-bath for ten minutes at 70° , or the rain bath for thirty-five seconds at 75° , under twenty pounds' pressure, is the most useful method. Once or twice a week the wet pack may be followed by a rain bath for ten seconds of lower temperature and higher pressure—say 90° , reduced quickly to 60° , under thirty pounds' pressure; and the jet douche, five seconds at 65° F.

The depressed types are benefited by daily cold affusions at home, while standing in warm water. The hot-air bath, to bring the cutaneous vessels into activity and fill them with blood, is an excellent preliminary measure in institutions. This is followed by the rain bath for thirty seconds at 85° , reduced gradually to 70° during the first few applications, and later to 60° . This may be followed by the spray douche for five seconds at 65° F., or the jet douche for three seconds at 65° to 55° F. The temperature may be lowered daily one degree until the lowest is 50° or

less, if well borne, and the pressure may be increased two pounds every day until thirty pounds are reached. The patients should not be hastily dealt with; gentleness, combined with firmness, will bring success in this, as it does in all hydriatic practice.

In the reports of the Montefiore Home for 1890, a case of this type is referred to by Dr. Ettinger as follows: "Among those cured we wish to refer to a young girl who came to us with a complete palsy of the left arm and blindness of the left eye, of functional origin. For two years she sought relief everywhere without avail. She was then referred to us as a hopeless case, but it has been our good fortune to completely restore the power to her arm and vision to her eye, and to remove her immense depression of spirits. She is now supporting herself as a domestic. This is the type of a number of similar but less severe cases where we have been equally fortunate. In all cases hydrotherapy has been the important therapeutic agent. In one case of severe hystero-epilepsy in a man, it has been the one agent to which improvement is due."

The following is a brief history of the last mentioned case, which Dr. Ettinger has kindly written for me lately:

Judah Sharp; aged 58; Dutch; negative family history; gives history of convulsive seizures of twenty-five years' duration, often from ten to fifteen times a day. After admission he had from one to three seizures daily.

Diagnosis: Hystero-epilepsy.

Treatment: Charcot douche daily, especially to spinal column, resulted in gradual diminution of convulsive attacks to complete cessation at the end of three months. After complete freedom for another three months he was discharged.

The following brief outline of a case, which is admirably detailed in all its scientific aspects by Dr. Bourneville in *Progrès Médical* for August 26, 1882, may also serve as a clear illustration of the capabilities of hydrotherapy in the most severe types of hysteria: "The father and grandfather of the patient were nervous and had migraine; the mother had convulsions and torticollis in infancy; one maternal aunt is an idiot; brothers and sisters died of convulsions; the patient had convulsions for nine months. An attack of hystero-epilepsy, which is admirably portrayed, occurred in February, 1880; then sensorial hemianæsthesia, zones hysterogènes, and aura. The convulsive attacks and contortions, re-occurring with great regularity, are fully described; they were followed by laughing and delirium. The treatment had consisted of tonics, bromide of camphor, baths, and gymnastic exercise. Cold douches, rain and jet, were now administered from thirty to forty seconds, from April 16th to May 3d; a vigorous hydrotherapy was next pursued, once a day until the end of the year. In August the attacks became more rare and brief, and ceased entirely on December 13th. During the

first three months of 1882 the child showed great irascibility, and was subject to nervous laughter. The douches were resumed. On August 24, 1882, the child's condition was good, and there have been no new attacks." (Quoted by Duval.)

NEURASTHENIA.

The treatment in these cases is almost precisely like that detailed in hysteria, the aim being to endow the nervous system with power to resist the depreciating etiological influences, whose removal is, of course, the *sine qua non* of treatment. In no class of persons will more judgment be required in the selection of proper methods of treatment. The types referred to in hysteria should be differentiated also in this disease. In domestic practice ordinary ablutions with water from 50° to 60° are very useful, the patient standing in warm water to prevent chilling.

There are two methods against which I desire to raise a voice of warning: (1) The indiscriminate use of the cold plunge for the neurasthenic has done much harm; (2) the practice of obtaining rapid alternations of heat and cold, by using warm and cold water in succession, is reprehensible. The application of warm water, as has been shown clearly in the chapter on the rationale of the action of water, produces a relaxation of the cutaneous vessels and tissues, and thus depreciates their tone and *diminishes their reactive capacity*.

Reaction being the chief aim of treatment, because this is the stimulus for whose conveyance to the nerve centres we apply cold water, the object is to a certain extent defeated. Friction with warm cloths would be far more useful in domestic practice as a preparation for cold ablution. If the latter is applied immediately after rising, while the surface is still warm from the bed, the effect will be more pronounced. In institutional treatment the French method gives admirable results. The hot-air bath, not carried to perspiration, fills the cutaneous vessels without relaxing them, as I have daily opportunity of observing. If the patients, thus prepared, are brought under the rain bath or douche, a lower temperature is borne with comfort, and results in increasing reaction and consequent vivification; or a higher temperature, necessitated by the feebleness of the patient, may be used with better effect. The Scotch douche is also useful in cases with localized manifestations. Above all things, water must be regarded only as a potent auxiliary, not as a panacea for hysteria and neurasthenia.

CHOREA.

In this disease my personal experience with the water treatment has been so gratifying that I shall refrain from detailing it, lest I may be charged with undue enthusiasm. It is, however, as an auxiliary measure to medicinal, psychical, and hygienic treatment that water is chiefly useful, as is the case in

other maladies. After failure with arsenic, iron, and other tonics, the simple addition of a mild hydrotherapy has served to emphasize the action of these remedies.

Domestic treatment is often sufficient in mild cases, but in those persistent types which are apt to become chronic and intractable, more active measures are required. Children affected with chorea bear low temperature well. The cold plunge, administered by a trained nurse, not by the mother, is useful; temperature, beginning at 90° , being daily reduced until 70° is reached.

Spinal douches, spray, jet, or fan, and the rain bath, at temperatures varying from 60° to 70° , of brief duration, not exceeding thirty seconds, are indicated if anaemia is pronounced. The fear of the little patient will readily be overcome by gentleness and higher temperatures in the beginning. It may be necessary for the nurse or mother to accompany the child into the douche room and accept a portion of the treatment at first. Only by gentle resistance and tact may success sometimes be achieved.

The following cases, cited by Duval, are of interest as showing the value of hydrotherapy in extreme cases even, and the methods of administration.

Acute Chorea.—The first is reported by Dr. Bergeron, of the St. Eugénie Hospital, in a boy 13 years old, who, after six months' convalescence from an attack of typhoid, was suddenly attacked with convul-

sive movements of the right hand, which was thrown about violently, and he became delirious and incoherent; the body was congested and covered with perspiration. He became conscious on the morning after admission to the hospital. Diagnosis of acute chorea being made, the boy was subjected to a rain douche. The child, being very much afraid, was gently placed under the douche, which caused him to gasp and exclaim that he would be made sick. He remained one and a half minutes. After removal, the choreic movements ceased completely, except in the laryngeal muscles. These disappeared so that he slept without any choreic movements. On the following day, there being slight movements and the child continuing to say "Na" frequently, he was again douched for one and a half minutes at 6 p. m. On the following day, the movements of the head being still noticed, another and last rain douche was given. A week later he was discharged cured. (*Méd. Contemporaine*, Jan. 15, 1865.)

Chronic Chorea.—The following case of the most unpromising type affords a good illustration of this treatment:

J. F., aged 21, seamstress, entered La Salpêtrière September 14, 1864. No hereditary history. Medium height; nervous temperament and very excitable. Menstruation commenced at 14, and was irregular. Three years ago, frightened by the explosion of a boiler, she fell, uttering a cry, and was seized with

several convulsions of short duration. Last year she became pregnant, and was satisfactorily delivered at l'Hôpital Necker. Two or three months afterward her character suddenly changed; she became irascible, choleric, wandering in her ideas, which even led her to contemplate suicide. Her appetite remained good, and all her functions were well performed. From no apparent cause, her left arm was seized several times by involuntary movements. Being a seamstress, she often pricked herself. Gradually these movements became more frequent, and even extended to the left leg. She now was frightened by someone jumping through her window, which greatly aggravated her case. The involuntary movements became incessant and extended to the right side, the face, and the eyes, which rolled in their sockets. The jaws opened and shut, and pointed convulsively to the right; on the right side the tongue was several times bitten, and the cheeks lacerated. Symptoms were more pronounced in the arms than in the legs, on the left than on the right side. During the night she enjoyed complete repose; no alteration of the sensibility. In this condition she entered l'Hôpital Saint Antoine, where she was treated with sulphurous and tonic baths. She left the hospital, improved, at the end of fourteen days.

She entered La Salpêtrière, Sept. 14th, in the following condition: Chorea very pronounced on the left side, severe movements on the right. She stood

feeble, even with the aid of a cane; when made to stand on the left foot, she fell. The face was convulsed with movements, speech difficult, tongue not controllable. The heart presented all the indications of choreic heart; no mental trouble, excepting very rapid speech. On Sept. 16th she was put under spinal-douche treatment. The jet was directed first on the most agitated parts, the left side of the body and the extremities, and finally up and down the spinal column until the skin reddened.

Sept. 17th: Same treatment.

From the 18th, improvement became marked. No more movements of right side, no more convulsions of face; only the left arm and leg were agitated.

Sept. 22d: All abnormal symptoms had disappeared, except that her voluntary movements were slightly quickened. When excited, the arms twitched slightly.

On the 24th she had entirely recovered, and even excitement produced no abnormal effect. Treatment continued. On October 5th she resumed her sewing, entirely recovered and her temper mild.

ORGANIC DISEASES OF THE NERVOUS SYSTEM.

The permanent bath, as detailed in the Berliner Klinische Wochenschrift, July 18, 1887, has given such striking results that it demands notice.

L. Riess offers his experience in the Berliner Allgemeines Städtisches Krankenhaus, 1874-1886 (see

page 62). The patient with compression myelitis died one year later from lung trouble. Autopsy revealed miliary tuberculosis, the remains of a spondilitis, cheesy peripachymeningitis, and compression and softening of the cord. And still the functional restoration of the cord was made possible in this case by baths.

In paraplegias of the lower extremities, paralysis of the bladder and intestines, etc., or in tabes, myelitis, and similar diseases in which bed-sores compelled the resort to permanent baths, the sores not only healed, but the other symptoms improved and receded, if not too far advanced. These symptoms were: local pains in the spinal column, excentric pains in the extremities, distressing contractures, reflex spasms, etc.

In chronic meningitis and apoplexies, brain tumors, etc., accompanied by hemiplegia and unilateral contractures, such baths have acted favorably. In general hyperæsthesia, cerebral excitement, delirium, etc., the calming effect upon peripheral irritations acts favorably on the main disease. Sleep is often induced in psychoses.

LOCOMOTOR ATAXIA.

Prof. Leyden, in his excellent summary of the therapeutics of tabes dorsalis (*Realencyclopædia*, Bd. 19), gives so clear and practical an account of the value and methods of bathing that I prefer to cite his

teaching to giving my own views. After saying of internal medications that none of them have the slightest curative value, that the unprejudiced physician will advise them only in order not to cut off all hopes of improvement from the patient, he uses the following language on baths (p. 457):

“These belong to the most important therapeutic methods in tabes, and their correct and cautious therapeutic use is of the greatest significance. All sorts of baths have been lauded in the disease, and not without reason. It should be remembered, however, that they do not complete the cure, but produce a pleasant, calming, invigorating effect. We must be careful above all things not to do harm, especially with too frequent, too hot, or too strong mineral baths. Baths should be given with great care and comfort to avoid colds. Hence patients should not be allowed to bathe much at home, especially in winter. It were better for them to be treated in institutions.

“The temperature should be according to the season and the individuality of the patient—95° to 86°—and the baths of five to twenty minutes' duration. The effect to be expected is in a general improvement and invigoration, especially a calming of the pain and an excitant, stimulant effect upon the sensory nerves. It may be regarded as probable that this mild excitation may exert a favorable influence upon the degenerative process, causing it to

cease. Even if we do not obtain positive cures by this means, their beneficial effect cannot be questioned.

"The hot-air bath should be used only in the beginning, especially if the disease occurs after a cold. The same may be said of simple warm baths. The salt and carbonated baths are applicable in the later stage.

"Much judgment is required for proper selection of the cold baths. Although their careless use may easily do damage, their cautious use has proved decidedly useful and beneficial, especially in summer, as they act refreshingly upon the muscular debility and entire condition, preferably in not recent cases. Patients do not bear strong waves, low temperatures, or frequent bathing. The beneficial effects of cold baths are traceable to the general refreshment and invigoration, to the excitation of the cutaneous nerves, and the protective hardening against colds.

"Hydrotherapy is now applied in almost all institutions with so much judgment and moderation that patients may be safely sent to them. The baths should begin with water at 88° and be gradually lowered as far as 72° F.; they should not be forced, however, if the effects seem unfavorable."

My personal experience is entirely in accord with the views above detailed. Hoesslein's recent marked successes with the application of hot-air baths, followed by affusions (*Münch. Med. Wochenschr.*, 1891), confirmed by Ziemssen, who observed some of the

cases, together with the testimony of Leyden and others, must lead to a more frequent resort to a cautious hydrotherapy in a disease in which medicinal agents have proved so impotent.

EPILEPSY.

In this disease the chief function of hydrotherapy is to counteract the debilitating effect of the bromide treatment. The daily cold ablution ($60^{\circ}-75^{\circ}$) and brief plunge bath, gradually lowered each day, have served me well in maintaining the patient's general health. The wet pack, followed by the half-bath, has also proved useful in preventing the bromide acne.

SUBACUTE AND CHRONIC NEURALGIA AND MYALGIA.

When Romberg said that "pain is the prayer of the nerve for better blood," he expressed axiomatically the therapeutic value of water in most forms of neuralgia. The general invigoration of the nervous system, the improvement of the appetite, digestion, and assimilation, are prime indications in the treatment of subacute and chronic neuralgias. Locally the Scotch douche is useful in sciatica and some cases of lumbago.

The hot-air bath to perspiration, applied every other day and followed by gradually lowered douches, is perhaps the most useful procedure. In anæmic and otherwise depreciated cases, the hot-air bath, followed by colder douches, or the wet pack referred to

in hysteria as a tonic procedure, may be alternated with the first. Fleury reports some remarkable cases, one of which, although of thirty-nine years' duration, was cured by two months' hydriatic treatment.

The following case from Duval may illustrate its value and the method to be adopted:

Dr. Clark, the English physician, who enjoys a just reputation in Paris, sent me, on May 16, 1867, Mme. X., aged 34, who in January, 1867, suffered from an intense lumbago; ten months later the pains attacked the lower extremities. After various measures, among them a large blister, had been used without relief, hydrotherapy was advised. When I saw her, the left leg was flexed upon the thigh. Madame could not put the point of the foot to the ground, and two persons had to carry her into the douche room. The treatment was preluded by a general ablution of three minutes, with water at 78° . On the following day this was repeated, with water at 65° , immediately followed by a spray douche of two minutes, promenaded over the entire body, and especially over the left leg, with water at 52° .

On the 18th a rain douche, without prelude, was given one and a half minutes, followed by a jet douche over the most painful part with water at 52° . This treatment was continued until the 26th without sensible amendment; on the 28th the douches were preceded by the hot-air bath. The following day brought a favorable change; the patient could now

support herself with the aid of the affected limb. Convalescence continued uninterrupted until July 28th, when she left us quite well. She returned, simply as a precautionary measure, for treatment from January till March, 1869.

My friend Dr. R. was attacked five years ago, after a season of hard professional work, by a severe sciatica of the right leg, to which he applied all the usual remedies without avail, having the counsel of Dr. E. Seguin, and also being treated by Dr. Wilkie. Hot fomentations to the course of the nerve, followed by rapid ablution, relieved the pain. Hot-air baths to perspiration, followed by the plunge into water at 65°, daily, produced so decided an improvement that he was able to leave his bed in two weeks and go on a trip, from which he returned with renewed health and vigor.

In recent myalgias, those cases which are so often sent to Turkish-bath establishments, the hot-air box bath, followed by gradually reduced douches, is far more efficient, because administered with more precision, and the physician is able to obtain the record of the patient's condition as a guide for future treatment.

CHAPTER X.

SUMMARY OF CONCLUSIONS.

A careful perusal of the foregoing pages demonstrates that the *uses of water in modern medicine* are based upon the fact that it fulfills every condition demanded of a remedy which appeals for recognition by the profession.

1. Its mode of action may be explained in many instances upon rational, well-understood principles, being based upon experiments on animals and man whose accuracy does not admit of doubt.

2. Water is capable of more accurate "dosage" than medicinal agents, because (*a*) the range of temperature from 40° to 115° admits of every phase of stimulation or depression; (*b*) the range of atmospheric pressure from 0 to 30 or 40 lbs. admits of the same gradation; and (*c*) the duration from mere impact to the more prolonged application affords an immense range of effect. Thus we have in the thermometer, pressure-gauge, and clock or sandglass, three elements of precision in dosing the application of water to the human body.

3. The clinical results, herein briefly detailed from the most trustworthy sources, entitle water to the highest appreciation of the profession, and justify the conclusions at the close of my article on Hydrotherapy in the American System of Therapeutics.

(Vol. I, p. 514), that hydrotherapy is an important and much neglected auxiliary in the treatment of disease. In many chronic diseases it has proved so successful after failure of medicinal agents that *no case should be yielded up as hopeless until hydrotherapy in some form has been tried.* My experience in the Montefiore Home, which receives only incurable cases, demonstrates the fact.

Domestic treatment by the methods indicated will suffice in most cases, but, if this fails, a methodical treatment by an expert hydrotherapeutist may be advantageous to the patient.

The most important elements are the thorough mastering of the general principles of hydrotherapy, precision in their application, and their perfect adaptation to the constitutional peculiarities of each case—*i. e.*, not treating the disease, but the patient.

For this reason the best consultants in Germany, Italy, and France—men like Leyden, Nothnagel, Binswanger, Senator, Ziemssen, Erb, Semmola, Dujardin-Beaumetz, and Charcot—send their patients to hydrotherapeutic institutions which are under the direction of educated physicians, who have studied the subject, with their diagnosis and general suggestions, rather than with specific directions for the method to be employed. So much depends upon the reactive capacity of each patient that only systematic observation can determine the most useful hydriatic procedure in each case.

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